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CONTENTS.

EDITORIALS:
- Specializing in Transmission-Line Design.....607
- Resuscitation from Electric Shock.....608
- Government Ownership of Telephone and Telegraph Lines.608
- Joint Meetings of Technical Societies.....609

DEPARTMENTS:
- Commercial Practice 616
- Electric Sign Data.....619
- Electrical Construction 620
- Public Service Commissions.....623
- Questions and Answers.....629
- New Electrical and Mechanical Appliances.....642
- Current Electrical News.....647
- Record of Electrical Patents.....653

LEADING ARTICLES:
- Electricity in Hat Manufacturing.....613
- Circuits for Elevator Signaling.....620
- Competition in New Jersey—II.—By William J. Norton..623
- Minnesota Electrical Association.....632
- Joint Meeting of Technical Societies in Milwaukee.....635
- Government Ownership and Operation of the Telephone and Telegraph 636
- The Boundaries and Divisions of Standardization.—By Francis B. Crocker.....639

MISCELLANEOUS:
- Utah Electrical Club.....610
- Plans for a Big Electrical Show in Chicago Next Fall....610
- Lecture Meeting of Columbus Jovians.....610
- Directors' Meeting of American Institute.....610
- Further Extension and Improvement in Chicago Street Lighting 610
- Louisville Jovians Have Secured Increased Numbers.....610
- Boston Truck Show.....611
- Chicago Mechanical Engineers Hold Meeting.....612
- Domestic Campaign in Philadelphia.....616
- New Electric Shop of Portland Company.....616
- New York Edison Company Furnishes Special Illumination for Exposition 617
- Unique Method of Installing Electric Sign.....617
- Arkansas Association of Electrical Contractors Organized.621
- A Device for Cutting Out Fiber or Hard-Rubber Insulating Washers.—By H. W. Parsons.....621
- English Central Stations and Electrical Contractors.....621
- Among the Contractors.....622
- Indiana Jovians Hold Rejuvenation.....640
- Jovian Rejuvenation at Dayton.....640
- Section of E. V. A. Organized in Washington, D. C.....640
- Michigan Section Plans Convention-Cruise for June.....641
- Proceedings of Joint National Committee on Electrolysis..641
- Chicago Jovian Meeting.....641

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SPECIALIZING IN TRANSMISSION-LINE DESIGN.

Electrical engineers desirous of doing highly specialized and useful work in a field of great commercial importance will find ample scope for their powers in the design of high-voltage transmission lines. Not that every engineer can perform signal work in this direction or even put his theories into practice, but the fact remains that at the present time some of the most powerful engineering concerns and some of the ablest specialists in electrical and structural problems associated with lines and networks are working at top-notch speed to find out the most economical forms of construction consistent with efficient and reliable operation. The fields of the civil and of the electrical engineer come very close together in this class of work, and the importance of thorough investigation in dealing with specific transmission problems cannot easily be overstated.

Until one undertakes to design a line according to modern requirements the number of variable factors involved is likely to be little realized. The inexperienced man assumes that once the size of wire is indicated by the allowable drop and voltage selection, the rest is plain sailing. Far from it. The longer the line, the more important it becomes to study at great length such questions as the influence of span upon bending and twisting stresses in the poles or towers; the stresses resulting from the breakage of different phase wires, from changes in sleet formation and wind pressure, the stresses on tower foundations of different design; effect of a broken ground wire; alteration of tower height or change in the position or height of conductors. The variation in mechanical stresses present in modern steel towers is evidenced by the fact that the sizes of steel members used in their construction range from 0.19 to 0.81 inch. This means that a comparatively slight saving in dimensions will effect a substantial economy in investment when a large number of towers are considered, provided the safe limits are not exceeded in the unit stresses. On important work the services of the structural specialist are worth many times their cost, and unless the electrical designer is also an expert steel man, as of course he may be, he will do well to consider the possibilities of co-operation before committing himself too definitely to rigid sizes and proportions in his supporting elements.

As more data accumulate on the ability of towers of specific designs to meet the test of service and time, and particularly as the results of steel-yard tests on

typical sample towers are disseminated and digested, the selection of suitable structural designs for stated limits of span, spacing and conductor size will become a more settled problem. Beyond this, as more systematic line calculations are made for different conditions, the electrical industry will approach somewhat nearer that wise selection of equipment for holding its high-voltage circuits which is the outcome of real engineering rather than of scientific guesswork.

The whole subject of tower foundations needs broader study. Topographical conditions enormously complicate the study of line stresses, but if engineers figure and preserve calculations for varied conditions along straight lines, the difficulties will at least be somewhat narrowed and the expenditures better controlled. Even the problems of designing special spans and towers for such humble transmissions as 2,300 or 6,600-volt river crossings needs more thorough consideration, since the growth of central-station and tie-line service necessitates leaping over many obstacles of local character and the cost of such solutions is by no means small. Thus, in the face of the most careful designing a recent 900-foot river crossing of a 2,300-volt line cost no less than $10 per running foot of circuit, and the two towers required to provide sufficient clearance in mid-stream weighed in the neighborhood of 20,000 pounds each. Certainly there are few branches of engineering where better opportunities to save money through careful designing may be found than in the transmission of electrical energy upon the comprehensive scale required by modern civilization.

RESUSCITATION FROM ELECTRIC SHOCK.

Much has been said on the subject of resuscitation in recent years, especially since the committee of the National Electric Light Association and the American Medical Association issued instructions for first aid. Men are beginning to realize now that most of the deaths which have occurred from electric shock could have been obviated if the victim's associates had been able to apply the proper treatment immediately, and most operating companies are now seeing that their employees have proper instructions along this line.

The following quotation from a recent book by Dr. Charles A. Lauffer expresses a truth which should be driven home to the consciousness of every person having to do with electrical work.

"It is a fortunate trend of public opinion that makes it incumbent on every intelligent citizen to know how to give artificial respiration. It is no longer exclusively the role of a physician to give artificial respiration, for if men in dangerous trades do not think enough of one another to practice the method, in anticipation of any possible emergency, why should physicians bother about it? Why should a doctor risk breaking his neck in a mad race to reach the scene of disaster too late to be of any service? Artificial respiration must be begun instantly by the victim's comrades, and the supplemental assistance is peculiarly the province of the physician.

"While there are more physicians per 100,000 of population in the United States than in any other country, a physician, like the policeman, is invariably out of reach when an emergency arises. Laymen simply must learn how to bring back life in an apparently dead body, else the number of fatalities from these tragic accidents, fatal because of the ignorance of bystanders, will continue to appall.

"Some stand-patter may insist that we are hearing too much about resuscitation these days; that a generation ago the general public was not expected to know anything about artificial respiration. We should realize that we are living in the midst of more dangers than a generation ago; the score of gases encountered in the industries and in our homes, the wide application of electricity, combined with other causes, have added to the perils of modern life; never before was the diffusion of the knowledge of resuscitation so necessary as in the present age."

GOVERNMENT OWNERSHIP OF TELEPHONE AND TELEGRAPH LINES.

Quite recently the subject of government ownership of telephone and telegraph lines has received considerable attention. For a while the possibility of the Federal Government acquiring the wire facilities of the country as a proposition advanced by the present administration was imminent. Later on the matter was made the subject of an inquiry by certain post-office officials and a voluminous report thereon has now been made public. Ardent advocates of the idea of the Government acquiring the telephone and telegraph facilities of the country have given full scope to their imaginations and volumes of argument in favor of the proposition have appeared in the daily press and in current popular magazines. Undoubtedly the champions of this proposition mean well, and so far as their researches have taken them their discussion of the matter may in their opinion be based upon facts and figures, the authenticity of which they presume may not be doubted. In all of this discussion, however, but little has been said in refutation of the mass of material employed by the advocates of government ownership, and where there has been an intelligent and conscientious attack made upon the proposition it has not had the same widespread publicity that has been accorded to the arguments of the proponents of government ownership.

It is singularly gratifying then that in the annual report of the Board of Directors of the American Telephone & Telegraph Company to its stockholders President Theodore N. Vail discusses the matter very fully. Beyond any doubt Mr. Vail is better qualified to discuss every phase of this question than any other man in the world today. Under his administration of affairs the telephone and telegraph facilities of this country have reached a greater degree of usefulness and have experienced a greater growth both in plant and in engineering efficiency than had ever before been accomplished in the same

period of time by the telephone and telegraph industry, or in fact any other industry. Mr. Vail has available resources of information, established facts and the results of undisputed experience that make it possible for him to discuss the question with authority; so far as his discussion being characterized by conscientiousness and patriotism, no one would dare gainsay the fact.

We quote at considerable length on other pages of this issue from Mr. Vail's comment in the annual report above referred to on the question of government ownership. Here is some philosophy that applies not only to the telephone and telegraph situation; it may be applied directly to practically every industrial corporation in its relation to the functions of the Government. Rarely have the issues been discussed so frankly and the disadvantages of governmental operation exposed in such uncompromising fashion. Leaving out of consideration entirely the technical difficulties always present in the operation of so delicate a service, the matter need only be considered upon a purely economic basis. Therefore, Mr. Vail's presentation should be read with care and analyzed completely. He has made a sturdy defense of his own particular interests, but in doing so he has established a basis upon which a safeguard may be built up for every other institution or industry thus unwarrantably assailed.

JOINT MEETINGS OF TECHNICAL SOCIETIES.

The rapid increase in recent times in the number of technical societies, both local and national, and in the number of local sections of national societies, has been largely responsible for the development of the movement for joint meetings. The increase in the numbers of national technical societies has been due principally to the increased specialization in all branches of engineering which has taken place during the last generation, and the increase in the local organizations has been largely due to increased engineering operations, evidenced by the ever increasing numbers of technical graduates of our colleges and universities, and resulting in a greater number of men interested in such subjects in local communities.

The movement was first manifested in a marked degree in the effort to center the energies of the local societies in our large cities. It is well exemplified in such places as St. Louis and Milwaukee, where instead of a series of meetings by each of the organizations there are held a series of joint meetings throughout the winter season, at which the subjects are either of a general nature which will interest men following different lines of activity, or are successively devoted to each of the interests involved. In addition to this there has been a tendency toward co-operation between the national societies where subjects of mutual interest have been brought forward for discussion.

The effect of specialization in technical lines was foreshadowed in scientific circles by the experience of the American Association for the Advancement of Science. This body, which is made up of scientists of all classes, found early in its career that scientific specialization had reached a point where separate sessions for those interested in the different departments of science were necessary; the result was the formation of a number of sections, each dealing with a separate branch of science. Specialization has now reached a point where even in a single science many of the workers are not familiar with the details of development in other branches of the same science, and even the papers presented at a single section will not interest all of its members. Moreover, this specialization in meetings largely detracts from the advantages which might be gained and which were intended by the meeting together at one point of scientists of all classes. The appreciation of this fact has led in recent years to the holding of joint sessions between different sections of the Association, at which subjects are presented which have, or should have, an interest for scientists generally and do not deal with the detailed problems of the specialists as such.

This idea should form the basic motive in the holding of all joint meetings of this character. Joint meetings of engineering societies should deal with topics which are either of general engineering interest or which bear upon the activities of two or more distinct and separate groups. It is through such meetings and the perusal of literature of a general engineering character that the specialist is able to keep in touch with general developments and not lose through his specialization the general appreciation of those broad phases of engineering which are necessary for the highest efficiency of every engineer, not excluding the specialist himself. Co-operation of this nature is seen to an increasing extent in both the joint meetings of local societies and in joint sessions of different national associations.

A somewhat different manifestation of the movement is seen in the action of the various engineering societies of Wisconsin, in holding joint conventions in the city of Milwaukee about one year ago and again last week. The report of this latest convention will be found elsewhere in this issue, and the large attendance at this convention indicates a real value in and need for conventions of this kind. A similar co-operation in an annual convention might be indulged in to advantage in other large cities where there are centered large numbers of local or state organizations and sections of national societies. To maintain their successful character, however, the essential elements of such conventions and their *raison d'etre* should be kept distinctly in mind. Their success will depend largely upon the proper selection of the program of papers and the giving prominence to those subjects which will either interest specialists in a number of lines or which are of general engineering importance. Papers which will interest only the narrow specialist should be barred.

Utah Electrical Club.

At the regular weekly luncheon of the Utah Electric Club held at the Commercial Club of Salt Lake City on March 19, George J. Henry, for several years engineer for the Pelton Water Wheel Company, gave some very interesting history and reminiscences connected with the installation of the first water-power plants in Utah and told something of the recent developments and performances of high-head plants now in operation.

W. F. Jensen, president of the Salt Lake City Commercial Club, the regular speaker of the day, took for his subject "The Building of a Metropolis." He pointed out the futility of attempting to build a great city without first developing the territory tributary to it, and indicated the prominent part which electricity is playing in the development of the territory contiguous to Salt Lake City, and how its use may be still further extended, particularly in its application to the farming, poultry and dairying industry.

Mississippi Telephone Suit Ended.

A little over a year ago the State of Mississippi brought a suit against the Western Union Telegraph Company, the Cumberland Telephone & Telegraph Company and the American Telephone & Telegraph Company for penalties on account of alleged infractions of its anti-trust laws.

The fundamental contentions of the State were based upon the ownership of Western Union stock by the American Telephone & Telegraph Company, and the agreement between that company and the Attorney-General for a disposition of that stock paved the way for an adjustment. An agreement has been made under which a decree will be entered, requiring the Western Union Telegraph Company, the Cumberland Telephone & Telegraph Company and the American Telephone & Telegraph Company to pay in the aggregate $50,000 in penalties.

No objection is made either to the organization of the Bell System or to the relation of the companies to each other, and their transaction of the telephone business in Mississippi is not criticised. The Legislature of Mississippi has approved of the adjustment by joint resolution.

This disposes of the only suit that was pending against any of the Bell companies, based upon a claim that any state anti-trust law was violated.

Philadelphia Jovians Prepare to Assist in N. E. L. A. Convention.

At a meeting of the Philadelphia Jovian League on March 19, the plans for the National Electric Light Association's convention to be held in Philadelphia during the first week of June were outlined by W. C. L. Eglin, vice-president and chief engineer of the Philadelphia Electric Company. It is expected the delegation will number 6,000 persons. All arrangements have been made for four special convention trains to be run into Philadelphia. The convention will be held at the Bellevue-Stratford and there will be an exhibition on the roof garden. The committee which brought the convention to this city, and of which Mr. Eglin is chairman, is doing everything possible to emphasize the importance and the ability of Philadelphia to handle large delegations. Mr. Eglin's committee will be assisted in handling the convention by the Jovian League.

Plans for a Big Electrical Show in Chicago Next Fall.

Preparations are under way for Chicago's 1914 Electrical Show, which will be held under the direction of the Electrical Trades Exposition Company at the Coliseum from October 31 to November 14. Chicago has not had an electrical show since 1911, the officers of the exposition company believing that the six former shows in as many consecutive years had satisfied the interest of the general public and that with a lapse of two or three years the old-time interest in an exposition of this character could again be created. All of the shows given in Chicago were successes, but the measure of success was not so great with the more recent shows as with the earlier ones.

"Consequently it was deemed advisable to give the public a rest," said Manager Homer E. Niesz, "and we came to the conclusion a few days ago that the time is now ripe from every standpoint for another big show. In former years we have held the show in January, running into more or less stormy weather which had a tendency to cut down the attendance. And we also found that four or five shows of other characters that preceded us in the Coliseum had a tendency to take the novelty away from Coliseum shows that came later in the season. So we decided to change the date and get in early. The Electrical Show will be one of the first of the winter season and we expect to make it such a big and attractive exhibition of trade products that the building will be crowded for the entire two weeks."

Manager Niesz has not sent out a formal announcement of the 1914 show to the trade, as it is his intention to give the exhibitors of the 1911 show an option until May 1 on the original space they occupied in the last show.

Electrical Show offices have been opened in Suite 546, Commercial National Bank Building.

Lecture Meeting of Columbus Jovians.

Another enthusiastic Jovian event was enjoyed by Columbus, O., electrical men on the evening of March 20. A hundred or more gathered at Rankin Hall to hear and see an illustrated lecture by M. S. Hopkins, of the Clark Management Corporation, whose headquarters are in Philadelphia. The lecture was descriptive of the corporation's hydroelectric plants, especially those operating under the name of the Tennessee Power Company on the Ocoee River. The system represents the highest achievement in this class of enterprise, both in modern equipment and amount of power generated.

By stereopticon views the process of installation was shown from the virgin ground to the completed plant. Mr. Hopkins, in his capacity as expert electrical engineer, was the man who recommended the location and oversaw the work of construction. He was formerly general superintendent of the Columbus Railway & Light Company, controlled by the Clark interests, and still has his headquarters in Columbus. S. G. McMeen, present superintendent of the local street railway and light corporation also made a very entertaining address.

Directors' Meeting of American Institute.

A meeting of the Board of Directors of the American Institute of Electrical Engineers was held on March 13 and a joint session with the Illuminating Engineering Society was authorized at the annual convention of the latter society.

Eighty-six applicants were elected as Associates; 55 students were enrolled; 10 elected and transferred to the grade of Member and four elected and transferred to the grade of Fellow.

President Mailloux was authorized to appoint three representatives upon a joint National Committee on Overhead Line Construction to include representatives of the following organizations: American Electric Railway Association, National Electric Light Association, American Railway Engineering Association, American Telephone & Telegraph Company.

Resolutions were passed referring to the death of Past-President Edwin J. Houston.

The report of the Committee of Tellers was read, giving the result of the balloting for nominations. The Board selected the following as directors' nominees; for president, Paul M. Lincoln; for vice-presidents, F. S. Hunting, N. W. Storer, Farley Osgood; for managers, Frederick Bedell, Bancroft Gherardi, John H. Finney, A. S. McAllister; for treasurer, George A. Hamilton.

Further Extension and Improvement in Chicago Street Lighting.

Negotiations are under way with every prospect of early conclusion for the installation and operation of an additional 1,000 flame arc lamps, or their equivalents, in the municipal street-lighting system of Chicago. This system was described at length in our issue of September 6, 1913, and it will be recalled that the present contract between the Sanitary District of Chicago and the City of Chicago calls for the installation and operation of 23,000 arc lamps of 450 watts each, or their equivalent in tungsten incandescent units.

The proposed additional contract provides that the energy for the 1,000 extra lamps shall be supplied at the same price, which is believed to be below the cost of production. It also calls for the replacement of about 7,000 old inclosed alternating-current arc lamps with the standard flame arcs used in Chicago, or with an equivalent wattage in other lamps. The possibility of using nitrogen-filled tungsten lamps is being considered by the engineers of the city and the district.

Automatic Control of Tools.

The third monthly meeting of the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers was held at the Seventh Avenue Hotel, Pittsburgh, Pa., Saturday evening, March 14, and was conducted by President Friedlaender, 72 members and guests being present.

After dinner an illustrated talk was given by H. W. Eastwood on "Electrical Aid to Factory Production." This dealt with the application of automatic control to machine tools. The following gentlemen participated in the general discussion which followed Mr. Eastwood's talk: O. R. Jones, W. O. Lumm, W. F. Detwiler, Walter C. Kennedy, and Paul Caldwell.

Rebates for Telephone Service Interruptions.

The New York Telephone Company has mailed notices to its New Jersey subscribers, whose telephone service was discontinued owing to line breakages in the recent severe snowstorm, that deductions will be made in current bills for this forced suspension of service; the company also asked indulgence while repairs were being made.

The Electric Club of Chicago.

March 19 was observed as a "Ladies' Day" by The Electric Club, Chicago, a large number of the members bringing their wives or sweethearts to grace the occasion by their presence. The Girls' Glee Club of Lewis Institute, under the leadership of George Lee Tenney, rendered several musical numbers and solos were sung by Misses Nathalie Gilmartin and Kathryn Wyre.

Louisville Jovians Have Secured Increased Numbers.

The Louisville branch of the Jovian Order, which until recently numbered only 15, was increased to the more respectable number of 83 on the evening of March 17, when the initiation of 68 new members was held, followed by an elaborate banquet, in which the novitiates, the old members and a number of visitors took part.

A uniformed degree team from Indianapolis, comprising C. S. Walker, O. P. Oblinger, H. Payne, J. Albright, N. Perry, H. Lehman, H. R. Victor, C. E. Roberts and F. L. Cavanaugh went down from the Hoosier capital on a special interurban car to assist in the initiation exercises, and in addition to these visitors, there were present in the city at the time, a number of electrical men, including Reigning Jupiter W. N. Matthews, of the national organization, C. M. Crofoot, of Crouse-Hinds Company, Cincinnati, O., Thomas A. Wynne, of Indianapolis, and B. B. Downs, of Hemingray Glass Company, Covington, Ky. The candidacy of Mr. Wynne as next reigning Jupiter was announced.

Plans for bringing the membership of the local branch of the order up to something like the strength which it should have, have been under way in Louisville for some time, and were fully carried out in the affair held the evening of St. Patrick's Day, at which James Clark, Jr., president of the electric manufacturing company which bears his name, presided.

In recognition of the Irish holiday, the menu cards, which were unusually handsome, were designed in green; the interest of all present in electricity being indicated by the use of electric terms throughout the menu in the designation of the various dishes. There was a full program of interesting addresses following the banquet, "the good of the order" covering the topics discussed comprehensively.

Now that the organization has secured an adequate membership in Louisville, it is the intention of those interested to keep it going. To this end the campaign for new members will not be relaxed until every man who is eligible has been brought into the order; and the Louisville Jovian League has been formed, as a sort of side-degree, to keep up the interest of all of the members by giving weekly luncheons, at which the social features will be emphasized, and matters of general interest discussed.

Boston Truck Show.

At the commercial vehicle section of the Boston Automobile Show, held last week in the Mechanics Building, Boston, Mass., two electric vehicle manufacturers and one battery company exhibited. The Buffalo Electric Vehicle Company, Buffalo, N. Y., showed a chassis for a one-ton truck, with driving and control apparatus in operation. The salient features of this truck are the straight-line drive, without the use of universal joints; and the double motor control, by which the foot lever provides variable-speed starting and reversing facilities entirely independent of the hand lever.

The General Motors Truck Company, Pontiac, Mich., exhibited a 1,000-pound chassis and a two-ton truck, with body. The noteworthy features of these vehicles are the high location of the battery, on top of frame, giving ample ground clearance, and the flexible drive shaft which tends to take up the shock, and relieves the motor of the abrupt variations in stress when the truck is passing over rough roadway.

The same company had on exhibition, one of its covered vans which has been equipped as an advertising car, for Bull Durham tobacco, by the Animated Advertising Company. The vehicle has glass sides suitably inscribed with the advertising matter; while inside a one-eighth-horsepower Holtzer-Cabot motor driven by an Exide storage battery, operates a flasher consisting of 18 fingers which depicts, in the painted glass sides of the car, a man making, and then smoking, a cigarette. This car, which is one of twelve thus equipped, goes by road to Kansas City, leaving Boston March 30.

The Philadelphia Storage Battery Company exhibited a group of four cells of the same type, which showed units manufactured in 1906, 1908, 1910, 1912. The most improved cell showed six added plates, a reduction of three pounds in weight, and an increase of 100 watt-hours over the cell of earliest construction. Another comparison of efficiencies was represented by a pair of balances, in one of which was a 21 W cell, weight 62.5 pounds, with 605 watt-hours' capacity. In the other balance was a 31 WTX cell, weighing 62.25 pounds, and having a capacity of 755 watt-hours. Another interesting feature of this exhibit was a fantastic lamp shade fashioned from diamond grid plates such as are used in the cells. In this cage was installed a 100-watt Mazda lamp.

The decorations and illuminating effects were practically identical with those used in connection with the pleasure car exhibition.

Chicago Mechanical Engineers Hold Meeting.

The Chicago section of The American Society of Mechanical Engineers held the third dinner meeting of the season in the Crystal room of Hotel Sherman on the evening of March 18. An exceptionally large attendance was caused by the discussion of the interesting subject, "Large Steam Power Plants," by men having responsible charge of several of the largest steam power plants in America.

Owing to the absence of Chairman P. B. Bird, Manager W. B. Jackson presided. Those who spoke were: I. E. Moultrop, Edison Electric Illuminating Company, Boston; J. W. Parker, Detroit Edison Company; John Hunter, Union Electric Light & Power Company, St. Louis; and W. L. Abbott, Commonwealth Edison Company, Chicago.

In opening the meeting acting Chairman Jackson announced that the sum of $2,000 had been given the national society by Mr. Hess of Philadelphia for prizes to junior and student members of the society. He then introduced I. E. Moultrop, vice-president of the national society, who discussed the progress that has been made in boiler-room equipment. It was only recently that instruments other than the steam gauge and water level have been used in boiler rooms. Load indicators, carbon-dioxide recorders and steam-flow meters are now being used, and a more intelligent grade of men is being employed, for the efficiency of a power plant is largely dependent upon the economy of the boiler room.

Mr. Parker then gave some of his experiences with the Detroit Edison Company, saying that this company will try distilled water as a means of reducing scale. Carbon-dioxide indicators, flow meters and draft gauges are in constant use. Field-controlled direct-current motors are used for driving the stokers and fans. Mr. Parker also emphasized the necessity for well trained men in the boiler room.

John Hunter then spoke on the work of the Union Electric Light & Power Company, of St. Louis. Power is now being received from the Keokuk power house at 110,000 volts, and transformed to 13,200 volts at the substation. Power for lighting is carried underground seven miles at this voltage to a substation delivering, 6,600 volts. Direct current and alternating current at 25 and 60 cycles are furnished. He stated that the iron water-cooling coils of the high-voltage transformers had to be replaced by brass, owing to the deteriorating effect produced on the coils by the strong magnetic fields surrounding the transformers. The old steam station is used as a standby, the prime movers floating across the buses or ready to pick up the load within a short time. He also gave some of his experiences with boiler-scale.

The subject, "Reducing the Cost of Electricity" was then discussed by Mr. Abbott. He states that further reductions in the cost of electricity may possibly be made by increasing the economy of the boiler room, by increasing the efficiency of condensers for turbines, and by the use of large generating units housed in simple buildings.

California Power Companies Declare Independent Possession of Distribution Systems by Municipal Government to be Impossible.

The Southern California Edison Company, the Los Angeles Gas & Electric Corporation and the Pacific Light & Power Company have recently issued a statement, declaring the plan of the city government of Los Angeles, Cal., to lease their light and power distributing systems and to assume independent possession of them, to be impracticable from both the legal and operative viewpoints until the city pays for the systems. The proposed plan embraced the possession, utilization and ultimate ownership of these distributing systems by the city. According to the power companies, such an arrangement would violate the covenants of the trust deeds securing their outstanding bonds, and in time would make it entirely impracticable to keep the companies' and the city's property apart, in that the city would utilize the companies' poles, ducts and substation buildings. Such a co-mingling of public and private property is said to be contrary to the constitution of the state of California.

The power companies have repeatedly expressed their desire to enter into a contract providing for the use of the companies' distributing systems for the distribution of such power as the city may generate, pending the time when the use of Owens River water by the city will be sufficient to develop all power required in the city, and pending the acquisition of a distribution system by the city. These companies have also offered to purchase the city's power at a fair price, as an alternative. Either one of these propositions, the companies claim, will produce an immediate revenue to the city of approximately $1,000,000 a year, instead of burdening the city with a debt of $5,250,000 necessary to construct another distributing system, and at the same time would assure consumers of the lowest possible rates (to be fixed by the city) and of no unnecessary duplication of distributing systems.

The city council has rejected these plans and is considering a bond issue of $6,500,000 for the construction of a municipal plant and distributing system.

Pittsburgh Jovians Adopt Westinghouse Memorial Resolutions.

The regular Jovian luncheon, held at Pittsburgh, Pa., on March 19, was in the nature of a memorial meeting in honor of the late George Westinghouse. Addresses were made on the life and work of Mr. Westinghouse by Col. H. G. Prout, president of the Union Switch & Signal Company, and by R. F. Emery, secretary-treasurer of the Westinghouse Air Brake Company.

An expression of the sentiment of the meeting was the unanimous adoption of the following resolutions:

Whereas, in the removal from the sphere of earthly activities of George Westinghouse, the Jovian Order has lost an honorary member who not only was a benefactor to the human race, but to whose unceasing efforts and keen foresight is due much of the wonderful advancement in the electrical industry, and

Whereas, his removal leaves a void in the industrial world, and his individual efforts in the field of engineering stand unique in the history of the world,

Therefore, be it resolved by the Pittsburgh Jovians here assembled that we feel a personal loss, and that the Jovian Order at large has been deeply afflicted in the death of our honored member, and

Further be it resolved that a copy of these resolutions be transmitted to the family of the deceased, and also that a copy be sent to the *Jovian Bulletin*.

Standardization of Electric Vehicle Charging Plugs.

The English Electric Vehicle Committee has approved of recommendations of its technical subcommittee relating to standard design of charging plugs. The 150-ampere size of concentric plug and receptacle recently standardized by the Electrical Vehicle Association of America was recommended as the standard for Great Britain. It is proposed that where a plug of somewhat larger capacity is required, it shall have the same standard diameters as the 150-ampere plug, the contact pieces being lengthened in proportion to the greater carrying capacity.

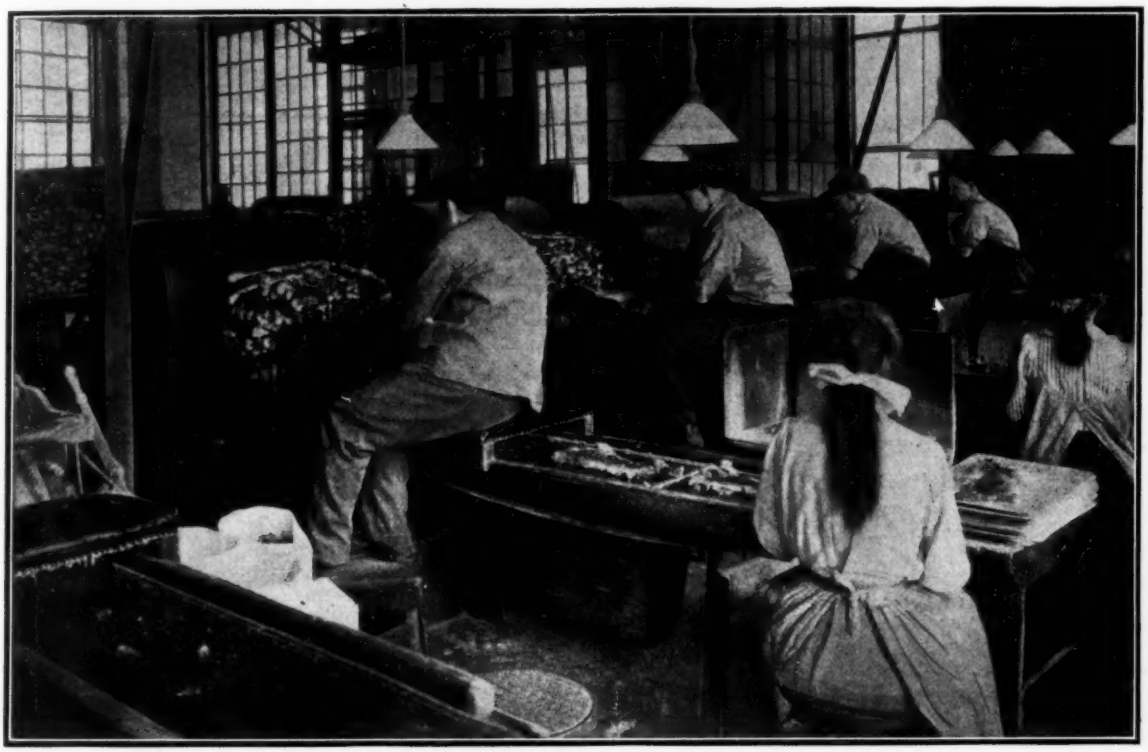
The question of grouting the shell of the plug and the receptacle as well as grounding the framing of the chassis, came under attention, but as charging would always be carried out at a pressure below 150 volts and the English Home Office regulations did not require grounding below that pressure, it was not considered necessary or desirable that in the design of the plug any provision should be made for it.

The Commercial subcommittee reported on rates and in consequence it was decided to circularize electric supply authorities in order to ascertain at what minimum prices they would be willing to supply electrical energy for charging the batteries of electric vehicles. In drafting the letter the secretary was directed to point to the desirability of making the prices as low as possible.

Electricity in Hat Manufacturing.

Although steam in limited quantities is essential in the manufacturing of hats, central-station service is justly becoming indispensable in this industry, due to the uniform speed of motor-driven machines, resulting in greatly increased output without additional cost for machines or labor, reduced fire risk and cleanliness. For the same reasons, also, electric heating is superseding gas appliances and, in fact, the heating question is sometimes the deciding factor in influencing the adoption of electric service.

The use of central-station service is rapidly gaining favor in hat-manufacturing plants because of the uniform speed of the motors, reduced fire risk and greater cleanliness. Electric heating is also indispensable in hat manufacturing and forms a very desirable central-station load. Data on heating and motor drive are presented in this article.



Group of Fur-Cutting Machines, Driven by 20-Horsepower Motor.

In all of the processes employed in hat manufacturing motor drive is being universally used, although even today many of the operations must necessarily be carried on by hand.

It is doubtful if there is any articles used by man, the watch not excepted, that requires better skill in its minute details or more delicate handling than the hat. The fur used in the manufacture of hats is taken from the skins of various animals, the principal being Scotch hare, Saxony hare, Russian hare, nutria, beaver, mink, otter, muskrat, Scotch rabbit, English rabbit, American rabbit, French rabbit, and Australian rabbit. It is interesting to know that the best quality of fur is that taken from the backs of the land animals and from the belly of water animals.

The skins bearing fur from which hats are made arrive in huge bales containing anywhere from 2,000 to 4,000 skins each. The first operation is to place them in large drums, which operate at a slow speed, in which they are thoroughly shaken up and cleared of dirt. Operators next take the skins and, placing them on a forked stick, slit them down the belly and trim the jagged ends. Then comes the dehairing operation. Placed in machines that either shear or pull the hair from the pelt, the final result is a soft mass of fur still left for further treatment. There is always considerable hair in each pelt and only one or two ounces of fur. Before the dehairing is done it is known just how much fur each pelt should produce. The washing drums are in most cases driven in groups of three by a five-horsepower motor.

Raw fur does not naturally "felt" well, so the next step is to clean the fibers with water and then brush them with a solution of nitric acid and quicksilver. This is called "carroting" and without it the hat manufacturer would find it impossible to carry on his business. After drying in the air or in an oven, the fur is ready to be cut from the skin. The skins are fed into a machine that shaves off and deposits it on an apron moving along a table, where it is packed in paper packages and stored in the great storeroom piled high with the assorted packages of fur. The clipping machines are also usually driven in groups of three by 10 horsepower motors.

After carefully selecting the various kinds of fur necessary to make the hat wanted, it is mixed and put through a conical machine called a devil, which completes the mixing process.

From the devil the fur goes to blowers—a long frame contrivance open at the top save for wire netting—in fact, a series of chambers through which an endless belt runs. At the entrance to each chamber is a rapidly revolving spiked wooden roller in form not unlike the ordinary rolling pin. This whirls so rapidly that it makes the "fur fly" when the latter is fed to the machine automatically and at the same time the action

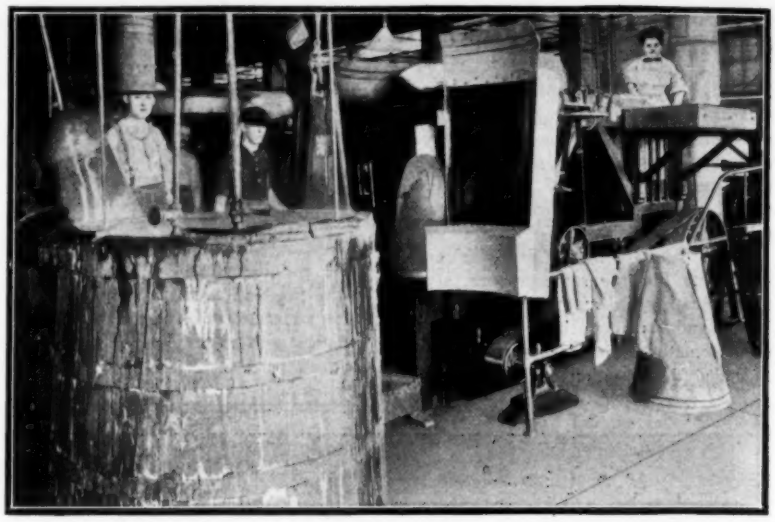
also removes from the material the heavier particles of hair and other foreign substances which fall through an outlet in the floor of the chambers. In the meantime the good fur is caught again by the moving belt and carried down the line from chamber to chamber for further clarification, until it finally leaves the machine thoroughly clean.

The stiff and the soft hats go through practically the same processes until the stiffening solution is applied.

The section of the fur in each case is determined by the color of the hat it is proposed to make. If the hat is to be black, the operation is a simple matter; but if it is to be of a light shade the proposition is of much greater importance.

After fur leaves the blowers it is ready to undergo the first process of actual hat making. In an adjoining room operators sitting before delicate scales separate to a fraction of an ounce the amount of fur that is to go into each hat. The next step takes the fluffy fur to the forming room. Here the fur gets the first of its many baths that account for the great quantity of water that is required in the manufacture of every hat. Operators feed the fur into large cabinets from wide boards, suggesting a part of the old style cylinder printing press. Every time the doors of one of these cabinets are opened an operator places inside a copper cone about two and one-half feet high, which is hollow, perforated, and wet. Directly beneath it is a rapidly revolving fan, which constantly draws the air towards the cone.

When the cabinet doors are closed a flurry of fur—just enough for one hat—fills the compartment and the particles follow the air current and adhere to the wet surface of the slowly revolving cone. When the latter has drawn to itself all the fur, which requires only a few seconds, the doors are swung open again, wet cloths are wrapped about the covered cones to facilitate the holding properties of the fur and they are immersed in warm water. When the fur is finally slipped off it is a long, c nical shaped, soggy object, resembling wet blotting paper, and therefore far removed from the suggestion of a hat.



Group of Hat-Forming Machines, Each Driven by a 25-Horsepower Motor.

At adjoining tables all the cones of felt are carefully inspected. So carefully has the material for each hat been weighed that although at this point it looks like anything but a hat, the operators know that with proper handling it will eventually shrink to the exact size required, becoming thicker and more thoroughly "felted" as the procession of processes continues. Passing into other hands, the steadily shrinking objects are plunged three at a time into hot water and manipulated by hand and rolled by machines until they finally reach the desired measurement—about one-third of their original size.

With the marks of each operator and the size marked in color or notched on the edge, the embryonic hats next pass to another room and are looked over for defects. The edges are trimmed by machines, and the next move is to the drying room, where a current of hot air is blown over the hats. From the drying room the hats go to the trimmers.

The dyeing room, where huge vats filled with the purest of dyes of various colors and capable of holding twenty-four dozen hats at one time are found, is the next objective point of the smooth, shallow, felted cones. They require about three hours properly to absorb the dye. From the vats the colored cones go to the extractors, a machine with a capacity for twenty-four dozen hats at one time—which literally whips the water out of them by centrifugal force.

After becoming thoroughly dry the material for the stiff hats goes to the stiffening room, where an operator dips that part of the cone which eventually will be the crown of the hat, into a preparation of shellac cut with alcohol, and then spreads it carefully with a brush. That part of the cone which will go into the brim is more thoroughly saturated with the same mixture by a machine, because it must show greater stiffness in the finished product. The cones then are placed in metal cylinders to "seat," and from them go to the reclaimer, which draws out all the alcohol by condensation.

From the condenser the cones go into steam boxes for several minutes so that the shellac may be melted and driven into the body. The felted cone next is dipped into a hot alkali bath. It instantly softens again, and any of the shellac adhering to the outside is dissolved and removed by a cold water plunge. It is at this point that one be-

Finishing Department, Driven by Electric Motors and Using Electric Irons.

Sizing Machines in a Hat Factory.

gins to see the material take the hat form. After another hot bath, the cones are placed in stretching machines and roughly formed. They then are placed over wooden crown blocks and shaped by hand, while the part that is to go into the brim is pulled out at the right angles. The application of cold water immediately brings back the snappy crispness to the article.

After being thoroughly dried, the material is ready to go to the finishing room and take its true form. After the entire fabric has been softened in a steam oven, the crown is placed in an impressed steel mold or die corresponding to the true type of crown that has been ordered. As the styles change, new steel molds are added to this equipment.

When the hat has been softened by heat and properly placed, the operator sets in motion with a lever a steel plate to which is attached a plain rubber bag. This bag drops squarely into the inverted hat. Cold water at a pressure of 500 pounds to the square inch is forced into the bag, and in expanding the latter makes the felted material conform exactly to the lines of the mold. With the steel touching the outside of the hat any slight inequalities that may arise appear only on the inside, while the outside surface is perfectly smooth.

The hat now has assumed the ephemeral characteristics of style and the last steps of finishing are begun. The product appears almost perfect as to its crown, but the brim still stands out at right angles, stiff and flat. The first operation is to give the crown its proper "feel" by placing the hat upon wooden blocks and rubbing the outside carefully with "pouncing" paper—a kind of sandpaper. This removes the rough surface. Next, the luster is brought out by an operation known as "leuring." The "leur" is nothing more than a piece of coarse muslin stuffed to the size of a brick for convenience in handling. It is heated by contact with electric stoves and with it grease is applied and thoroughly rubbed in. The crown now is finished, and the hat passes to the experts who are to trim and shape the brim to the size and style required. One machine cuts the brim according to specified measurements, and another one, after the hat has been softened by heat, curls up the edges—a rather wide turn on the sides and a narrow one front and back. Here the brim again is softened by heat and shaped by hand to the desired style. When this is completed, the hat has passed through the last of the actual manufacturing processes and the remaining work on it—the binding of the brim and the attachment of the sweat leather, the band, and the bow—is done by expert girls.

The stiff hat, or derby, now is complete, and after inspection it is packed for shipment.

All this time the soft hat has been proceeding rapidly toward completion over another road from the point where it separated from the stiff product. In the stiffening department it was treated with a much weaker solution of shellac, and, when blocked and dried, retained its identity as a soft hat. The proper surface was obtained by placing the hat in an oscillating machine and removing the excess hair by the application of sandpaper. After a heating, it was shaped by being drawn over a wooden block and thoroughly ironed. It was "pounced" and "leured," and the brim was ironed over a cold flange to give the desired shape.

In all of these various processes motor-driven machines are employed but as practically every factory uses special machines, usually of its own manufacture, no definite figures can be given as to horsepower requirements. Squirrel-cage induction motors are recommended for hat factories and these should usually be mounted on the ceiling or on the platforms so as not to be affected by water.

Electric Heating.

Heretofore gas-heated apparatus has been chiefly used in this industry. Now all the progressive plants are operated electrically. An electric heater can be arranged to provide any temperature obtainable with gas-heated apparatus. It is not affected by air drafts and does not fill the work room with soot. This cleanliness is of particular importance in the manufacture of light-colored felt hats. By its use, the fire risk is eliminated as there are no exposed flames. The worker is not exposed to the hot, ill-smelling waste-gases which rise from tools heated by the gas blast, and the problem of ventilating the hat factory is greatly simplified.

Weaving Room Where Silk Bands are Made—Individual Drive Throughout.

The favorable results, obtained through the adoption of electric heaters, are made evident to those concerns which use them by a very material increase in the output of the factory and by a reduction in manufacturing cost, while the cost of the heat required per unit of the article manufactured is decreased. The productive capacity of both skilled and unskilled labor is increased, and the conditions of the operatives greatly improved.

The electrically heated hand shells now in general use are patterned after those used for many years by journeymen hatters. They are employed in flanging and finishing, at pressures varying between 100 and 125 volts, and consume from 300 to 500 watts.

The heating element is proportioned to suit the service for which the irons are to be used; a moderate heat being required for finishing and a high heat for flanging and curling. These irons can be used on either alternating or direct-current circuits.

Machine irons are constructed in the same way as the hand shells, the heat being confined as closely as possible to the working surface. These irons are fast supplanting gas-heated shells, as the heat is constant, is not subject to jolt or draft, and is uniformly distributed over the entire working surface. One operator can tend to a group of irons, thus turning out more work.

It is well known that the successful operation of the ironing machines requires a fixed relation between the speed of the machine and the temperature of the shell. This relation is accurately attained by the use of the electrically heated machine shell; the speed can be considerably increased, so that a larger output can be obtained without increasing the number of machines or attendants.

Electric velouring stoves are made in several sizes, and are adapted for use in any position. They, too, are not affected by drafts and cause neither soot nor odor. They operate at various voltages, from 100 to 125, with a consumption of from 275 to 300 watts. They are particularly applicable for use in the packing and shipping room for the final "luring off" of the hats before shipment.

The electrically heated velouring stoves provide even temperatures over the entire working surface and are so designed that fine fur or dirt cannot collect below them, a condition not usually obtaining with gas-heated apparatus.

The shackle stove is constructed in the same manner as a velouring stove, but the working surface is divided into two portions. One part is worked at a high temperature for heating the hand tools, etc. The other portion has a slightly lower temperature adapted to keeping the hand shackle at the proper working temperature. These stoves consume from 500 to 650 watts. Electrically heated shackle irons can be made to give a curl of from about one-quarter to one inch.

Electric heaters for the ovens, in which stiff hats are heated before going to the hydraulic presses, are among the latest and most efficient electric apparatus used in the manufacture of hats. An oven can be arranged to be heated interchangeably by either electricity or steam.

Press heads for printing and embossing presses are hat-making devices for embossing the bands and tips. Here the use of electric heat is exceptionally economical and safe, as the heat is generated immediately below the working surface and transmitted directly to the point at which it is needed. The heating element is divided into a number of sections, which permits the localization of the heat in any section of the press head or the use of the entire head for work in hand.

Agar machines for soft hats and Turner machines for curling stiff hats are also among the electically operated hat-making devices. The electric heater for use on the Agar machine is semi-circular in shape so that it will fit closely against the revolving disk. The cleanliness of electric heat on this machine is an obvious advantage, particularly when light-colored goods are being handled.

Specially shaped machine irons, heated to a high temperature, are used on the Tweedy machine in curling stiff fur hats.

One of the most important devices used in the hat industry is the electrically heated flanging bag. It differs from the regular pattern in that the heat is applied directly to the sand by an electric heater buried in the sand. Instead of applying heat only to the working surface of the bag, by resting it on a steam-heated baker, the heat is applied internally. The heating element is flexible and readily conforms to any contour the bag may assume when in use.

Electrically heated flanging bags are usually installed with a compound pulley placed at the ceiling, by means of which the bag can be readily raised and lowered.

In heating or softening hat brims, instead of exposing a large heating surface, as does the steam baker, the oval plate of the electric brim heater is of practically the same dimensions as the brim of the hat. It has an opening cut in it slightly larger than the crown so that the surface through which heat is applied is of essentially the same dimensions as those of brim to be heated. The operating temperature of the heater can be easily made to suit the different kinds of work.

Commercial Practice
Management, Rates, New Business

Domestic Campaign in Philadelphia.

The Philadelphia Electric Company has inaugurated a most aggressive campaign of educational publicity looking to a radical increase in domestic use of electricity. Householders are first informed as to the economies attending the use of electricity, economies in time and labor. The next step shows the practical benefits resulting from heating, cooking and cleaning by electricity; body massage, hair curling, vacuum cleaning and the other domestic services possible with electricity. Then follows a proposition to install wiring on the deferred-payment plan and, later, an installment proposal covering all the devices used in a household. The plan has been worked out along logical lines and is in every way the best planned and most effectively executed advertising campaign ever attempted by the Philadelphia Electric Company. Daily newspapers, booklets and direct approach are being used.

New Electric Shop of Portland Company.

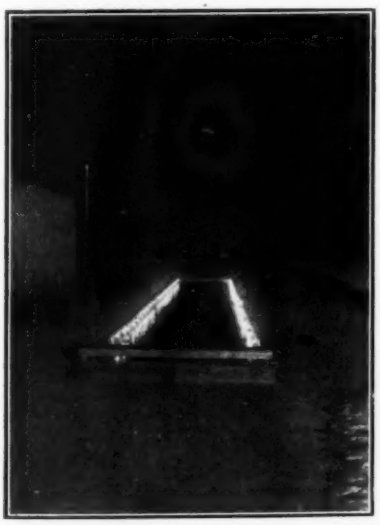
The Cumberland County Power & Light Company, Portland, Maine, just before the first of the year opened an "electric shop" in the heart of the shopping district of the city, where apparatus is displayed for the purpose of demonstrating to the public the variety of devices offered and their mode of use. The company installed a meter panel with two rows of lamps, of

corresponding sizes, ranging from a four-candlepower carbon lamp to a 250-watt Mazda lamp. One of the two meters is connected to the top row of lamps and the other to the lower row, each lamp being controlled by a separate switch. By this means any lamp in one row can be compared with any lamp in the other row and their relative brilliancy observed by interested customers. For this purpose of illustrating the relative current consumption of the carbon and Mazda lamps, the carbon lamp of any size is thrown on one meter and the corresponding candlepower Mazda lamp thrown on the other meter and the relative speed of the two meters is shown to the customer.

The method of reading meters is also explained to customers, and the customers are urged to acquire the habit of reading their meters. Advertisements in the local newspapers urge the public to visit the apparatus exhibit and familiarize themselves with electrical processes so far as possible.

New York Edison Company Furnishes Special Illumination for Exposition.

At the recent Sportsman's Show held at Grand Central Palace, New York City, the New York Edison Company had charge of the special illumination which attracted unusual attention from every visitor. Special lighting equipment rep-



Illumination of Fly-Casting Tank on Roof of Grand Central Palace, New York.

resenting a connected load of 48,000 watts was installed and most pleasing effects were produced.

The Edison Company's bureau of illuminating engineering arranged all the lighting for the exposition, replacing the usual lighting on the main floor of the building by 150- and 200-watt tungsten lamps, the bulbs of which were stained to produce a pale blue glow. Added to this was the light of nitrogen lamps placed in the urns around the balcony rail and suspended in the well of the building. There were 24 of these lamps,

Main Entrance to Sportsman's Show, Held at the Grand Central Palace, Showing Special Illumination.

each in a glass reflector and shaded with green gelatine screens. The fly-casting tank and the trap-shooting range on the roof were illuminated by spot lights and incandescent lamps. A view of the former and a view of the main entrance are shown in the accompanying illustrations.

Unique Method of Installing Electric Sign.

The accompanying illustration shows a novel electric sign recently erected by the St. Joseph Railway, Light, Heat & Power Company, at St. Joseph, Mo. The sign, which reads "*Do It Electrically*," was erected on a stack of reinforced concrete measuring 150 feet in height, and 9 feet internal diameter. The sign is approximately 100 feet long, beginning near the top of the stack.

It may be stated that the letters are each three feet eight inches high and three feet four inches wide and they are illuminated by double rows of 25-watt Mazda lamps with 40-watt lamps on the first letter of each word. The sign is operated by a flasher and is easily legible ten blocks away. The frame on which the letters are mounted is of structural steel with cast-iron hooks at the top which hook over the top of the stack. These hooks are three in number and weigh about 130 pounds each. The entire frame weighs approximately 3,000 pounds and the frame is held to the stack by means of seven-eights-inch steel rods girding the stack.

It is interesting to note that when the stack was erected it was not thought necessary to equip it with a ladder on account of the fact that, being of reinforced concrete, no repairs or other attention would be necessary. It was necessary therefore to find some method of reaching the top of the stack for installing the sign.

An ordinary 75-cent umbrella was used as a parachute inside the stack. A light seine line was attached to the umbrella and a long stick used to hoist the latter inside the stack to a point where the hot gases from the boilers caught it and took it out over the top of the stack. A steady and stiff breeze carried the umbrella away from the stack until it was rescued from the roof of a neighboring building. With this light line a heavier cord was pulled over and then a sash cord next. To the end of the latter was attached a single strand of No. 10 iron wire. A seven-sixteenths-inch messenger cable was then pulled over and a pair of blocks attached to the outside end of the cable and then pulled back until the blocks stood at the top of the stack.

Although the foregoing gives the method used, as a matter of fact several umbrellas were used up and many trials made before the heavy line was pulled over. The umbrella would refuse to raise a line which was too heavy and too light a line would part on attempting to pull it over the stack.

Electric Sign Erected on Stack Under Unusual Conditions.

By means of blocks and tackle a lineman was pulled to the top of the stack and other blocks hung, by means of which the sign was hoisted. The engineering features, construction of the frame and first scaling the stack were in charge of E. J. Billings, superintendent of power.

Data on Electric Shovels.

As a field for central-station power the electric shovel has been steadily increasing in importance and today this class of business occupies a position relatively as important as the many other electrically operated machines used in excavating, building, coal handling, etc.

For possibly 10 years prior to 1884 successful steam shovels were made and used on certain classes of work, but it was not until then that they were manufactured in quantities and began to play an important part in all classes of excavation. From that time up to the present day there have been gradual but continuous improvements on the original shovel, not only in the mechanical construction, but also in the design of boilers and engines best adapted to this class of service.

Some interesting data on the application of electric motors to shovels were presented recently before the American Institute of Mining Engineers, by H. W. Rogers, which show the possibilities in this field.

In proposing a change from steam to electric operation we have to deal with a steam equipment which has not only proved its worth, but has probably reached its highest stage of development and efficiency. That the electric shovel is a possibility cannot be denied, as at present from 12 to 18 shovels are in operation in this country. These shovels may be divided into three classes; the friction-electric, which is operated by a single constant-speed motor with friction clutches; the three or four-motor direct-current equipment, and the three or four-motor alternating-current equipment. It is the second and third classes that are discussed, as the friction-electric does not compare favorably with the steam shovel so far as speed is concerned, although it may be operated as cheaply.

There is probably no other class of machinery that presents a duty cycle as severe as that of the shovel. It is very short, varying from 7 to 12 seconds on the hoist, 7 to 12 seconds on the thrust, and 10 to 18 seconds on the swing, making a complete cycle in from 17 to 30 seconds. The motor to meet these requirements must have a sufficiently low armature inertia to permit of rapid acceleration and quick reversals under small power. It should also be a motor of rugged design, as it must be subjected to severe overloads and shocks and frequent reversals. This is especially true of the hoist motors and, to a lesser degree, of the swing motor; the thrust motor is practically stalled during the digging operation, although it may revolve or overhaul, according to conditions, and is operated at full speed only after the hoisting operation is completed.

In the case of the hoist, considerable advantage may be gained by using two motors of small capacity instead of one large motor, as the power required for accelerating is much less. For example, assume a shovel that requires a 150-horsepower, 425-revolutions-per-minute motor for the hoisting operation; this motor requires 117-horsepower torque to bring it to speed in one second whereas if we substitute two 75-horsepower, 500-revolutions-per-minute motors in place of it, each motor requiring 32.3-horsepower torque to bring it to speed in one second, or 64.6-horsepower torque to bring both motors to speed in one second, there would be a saving of 45 per cent in the power required to accelerate the motors alone.

Although there may be some demand for equipments to operate on direct-current circuits, the greater part will be required to operate on 60-cycle alternating-current circuits. The direct-current series motor has the characteristics of the steam engine, in that it gives its heaviest torque on starting, speeds up under light loads and slows down under heavy loads. It is much easier to control and requires considerably less apparatus, insofar as the control is concerned, than the alternating-current equipment.

The saving in operating expense of the electric shovel over the steam shovel will depend somewhat upon the comparative cost of coal and electric power and will vary for different localities; but it should be remembered that the electrically operated shovel eliminates the fireman, watchman, coal passer, teaming for one-half day, the use of water, and considerable waste. The natural increased wear and tear of parts having a transverse motion as compared with those having rotary motion and the elimination of boiler trouble should also be considered.

Labor per Shift	Steam	Electric
Shovel runner	$ 6.00	$ 6.00
Craneman	4.00	4.00
Fireman	2.50	....
Six pitmen at $1.75	10.50	10.50
One watchman	1.75	....
One coal passer	1.50	....
Teaming (½ day)	2.50	....
Oil and waste	1.50	.75
Total	$30.25	$21.25

For convenience in comparing the costs of operation on steam and electric shovels the costs are all reduced to a day basis.

	Steam	Electric Direct Current	Electric Equivalent Alternating Current
Interest at 6 per cent	$ 5.20	$ 7.75	$10.85
Depreciation at 4⅔ per cent	4.03	6.00	8.43
Repairs at 10 per cent	8.66	....	....
Repairs at 6 per cent	....	7.75	10.85
Labor per shift	30.25	21.25	21.25
Total cost per shift	$48.14	$42.75	$51.38

It has been assumed that, owing to weather conditions, delays, etc., the shovel working year consists of 150 days and the above figures are based on this assumption; also that the shovel is only working one shift a day.

In selecting a shovel equipment it should be remembered that although it is possible to operate with alternating current, it is cheaper to use the direct-current equipment, even with a motor-generator set, and have an outfit which more nearly approaches the characteristics of the steam shovel, and has much simpler control apparatus and requires considerably less power to operate it than the alternating equipment with transformers. In addition to this, any change in the frequency would mean a complete change in the equipment of an alternating-current shovel while it would mean only a change in the induction motor of the motor-generator set, with possibly a change in the generator fields, on a direct-current equipment.

Advice to Users of Electric Trucks.

The New York Edison Company is distributing to users of electric trucks an attractive card containing pertinent advice to be observed in operating motor vehicles during the winter months. The following is taken from this card.

Don't try to accomplish as much in the snow as you have on clear asphalt.

Don't start out in the morning until you are satisfied that your battery has been fully charged.

Don't try to push a drift ahead of you. Leave it for the snow contractor.

Don't sit still while the wheels go 'round in the slush. Have a box of sand and a kitchen coal shovel handy. Use sand liberally. It is cheaper than electricity.

Don't throw your power on full. Work it up gradually, not forgetting the sand box.

Don't forget an anti-skid device. An improvised one may be made by looping three or four turns of a rope around your tires.

Don't forget that time may be gained by leaving your wagon at the corner and making side-street deliveries on foot.

Don't let your truck stay out all night for want of a boost. The New York Edison Company has twenty-four emergency charging stations in New York where your firm's credit is good.

New York Edison Company Offices Change Location.

The general offices of the New York Edison Company were moved on March 23 from 55 Duane Street to Irving Place and Fifteenth Street.

The United Electric Light & Power Company will also move its general offices to this location on April 1.

The Edison Electric Illuminating Company of Boston is the largest taxpayer in that city, contributing $373,085 to the treasury. The assessed valuation of its real estate for 1913 is $6,632,900, and of personal property $15,000,000.

Electric Sign Data

Location and Appearance of Electric Signs.

The cost and value of a sign location is a point which has not been properly considered in the past. Sign locations along Broadway, New York, on the Boardwalk at Atlantic City, on State Street, Chicago, or in smaller crowded districts, have a very real value. They bring—and are worth—high rentals. But many merchants having equally desirable space for their own signs do not realize these values and consequently do not take advantage of the opportunity to capitalize them.

A sign location should be classed as "advertising space." In the newspapers or magazines, space is valued according to circulation—by which is meant the number of people likely to see the page. Sign space should be valued the same way. If a merchant has a prominent roof, where hundreds or thousands would see his sign every day, he is wasting an opportunity—wasting real money—if he does not utilize it. Just imagine having a large and valuable piece of newspaper space and neglecting to supply "copy" to fill it. Another way to bring this point home, is to compare a sign location with a display window. Can you imagine a sane merchant leaving his display windows vacant?

The sign salesmen carefully study the location before recommending a sign. Such study includes careful analysis of the number and class of passers-by, the distance from which the sign could be read, and the advertising advantage of spectacular display which one merchant would have over his competitors.

Daylight Appearance.

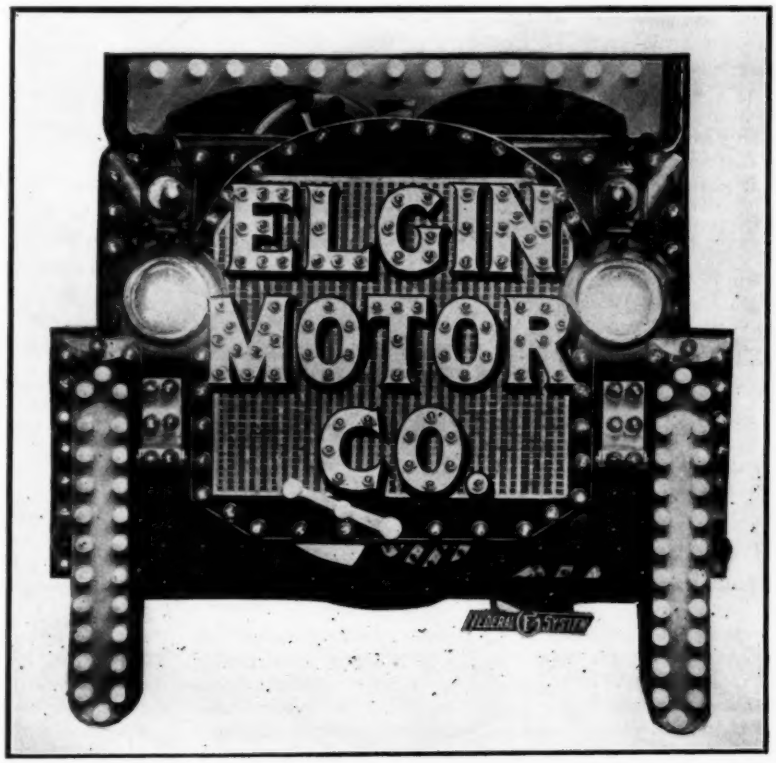
An electric sign should look well and carry its advertising message by day as well as by night. Daylight efficiency in electric signs sometimes adds to the cost, but it is worth the extra investment. Just as a merchant should light his display windows to get their after-dark value, so should he have a night sign which is effective by daylight.

It is difficult to lay down any rules regarding this matter which will apply generally. The best plan is to put the problem up to the sign manufacturer, explaining that daylight appearance is just as essential as the night display, and that designs submitted must stand the double test.

The most desirable colors are opal and yellow on account of their low absorption factors. Ruby is also much used as red light and is distinguishable at great distances. Green, blue and purple are not efficient for many practical purposes and are not to be generally recommended. Lamps of warm, contrasting colors give pleasing effects. In general a solid mass or continual line of color is more attractive than a mixture of colors as the introduction of different colors breaks the continuity of outline and thus detracts from the effect.

Color caps (color hoods) are a substitute for natural color glass lamps or dipped color lamps. The advantage over the former is that they are less expensive in the long run and over the latter, that they will stand the weather, while the color on a dipped lamp will generally wash off with the first rain. They also have the advantage of being readily changed, a man can have a red effect on his sign one week and blue the next week if he so desires at comparatively little extra cost.

By all means use color—but not too much. A touch of color gives charm and interest.



Sign manufactured by Federal Sign System (Electric) for Elgin Motor Company, Elgin, Ill.

Sign is approximately 8 feet square and represents the front of an automobile outlined in various colored lamps. Headlights contain 25-watt lamps, others being 5-watt.

Flasher gives effect of wheels revolving. Headlights burn continuously. Reading is displayed in 12-inch letters. Approximately 300 lamps are used. Sign cost, $300.

Electrical Construction

CIRCUITS FOR ELEVATOR SIGNALING.

Complete Installation for a Hotel.

In a hotel where the elevators are grouped close together, it is generally customary to have no elevator signal lamps or position indicators at the various floors, but to confine the signal apparatus to the cars themselves. The present paper describes an elevator signal system installed in Hotel La Salle, Chicago, Ill., by the Elevator Supply & Repair Company. This system employs an electric annunciator in each car in the form of a bank of low-voltage incandescent lamps. These annunciators are so wired, that upon the pressing of a signal button on any floor, the corresponding signal lamp is lighted in each of the cars in that bank, and continues to burn until one of the elevators takes on the passengers at the floor where the signal was given.

In order to make it easier for the reader to follow the explanation of this system, the wiring diagram shows the circuits for only one elevator and for only one of the push-button circuits.

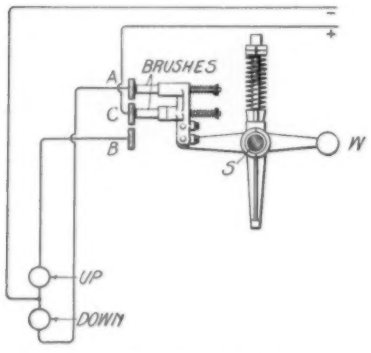


Fig 1.—Traveling Brush Holder.

The current for the signal circuits is generally obtained from a small motor-generator *D* located in the pent house, together with the fuses and signal operating apparatus. This motor-generator delivers about 10 volts, direct current, and supplies current for both the push-button and signal-light circuits.

Method of Operation.

Fig. 2 shows the push buttons located on the third floor of the hotel. If the upper button *U* of the push-button switch is pushed by a passenger waiting on that floor, current flows from the generator *D* through the solenoid *M* and back to the generator, thus energizing the electromagnet *M* and causing its armature to be drawn to the left so as to allow the lever *L* to drop into the mercury cup *P*. This permits current to flow from the terminal *A* of the generator through *L*, *P* and the "up" signal lamp for the third floor back to the generator, thus giving the elevator operator the signal to stop at the third floor.

After the elevator has passed the third floor, the circuit for the corresponding signal lamp is opened at the mercury cup *P*. This is accomplished by means of a commutating device shown to the right. This device, called a "slate," consists of brass segments fastened to a piece of slate as shown. Installed along the length of this device, and just in front of the brass strips, is a long threaded shaft which is driven through sprockets and a chain belt, by the shaft carrying the overhead elevator-cable sheaves. Upon this threaded shaft, whose direction of rotation is thus dependent upon the direction of elevator movement, is installed a traveling brush holder, whose brushes are electrically connected as shown in Fig. 1. The friction between the traveling nut of this device and the screw, holds the brushes against the set-back feed and the upper segments when the elevator has an upward travel, and against the set-back feed and the lower segments when the elevator has a downward travel. As the elevator passes the third floor these traveling brushes connect the center strip and the upper segment *3* electrically, thus completing a circuit from the generator *D* through the circuit-breaker *CB* in the car and the solenoid *R*. The electromagnet *R*, which is thus energized, attracts the lever *L*, causing it to break contact with the mercury in cup *P*, and thus opens the circuit for the "up" signal lamp for the third floor.

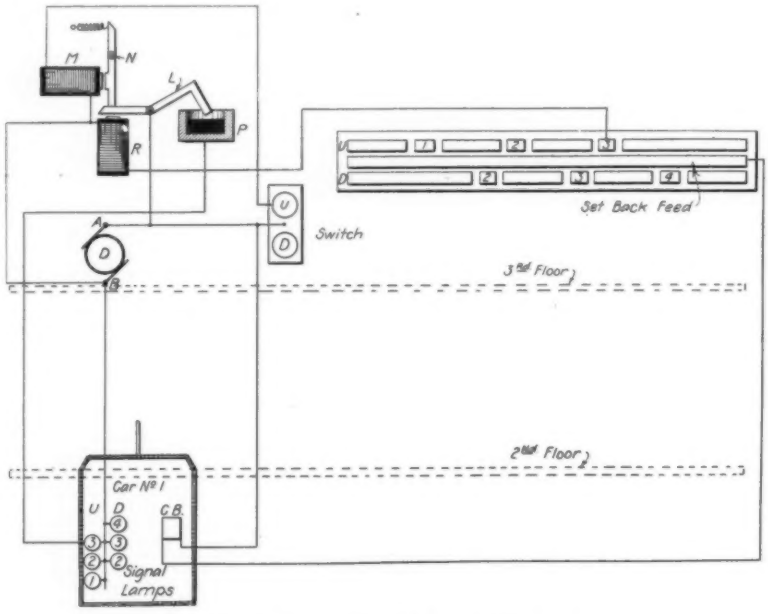


Fig. 2.—Wiring Diagram for Signal Circuits in Car.

A separate mercury cup with the necessary levers and electromagnets is installed for both the up and down signal positions on each floor, and a separate commutating device is provided for each elevator. However, the corresponding parts of these commutators are connected in parallel, as are the signal-lamp circuits for all the elevators affected by the same push-button signals. In this way the pushing of any signal button, causes the corresponding mercury contact to close the circuits of the proper signal lamps in all the

cars. As soon as any of these elevators traveling in the right direction, passes the floor from which the signal was given, the corresponding lamps in all cars are extinguished.

If a car passes the floor without taking on the passengers, the operator opens his circuit breaker as his car passes that floor, thus preventing the electromagnet *R* from becoming energized and opening the lamp signal circuit. The signal lamps in the various cars are thus kept burning until one of the elevators takes on the passengers.

In place of signal lamps various forms of annunciators may be used. Those used in the freight and servants' elevators in the hotel under discussion consist of white disks which are caused to cover circular openings when a signal has been given.

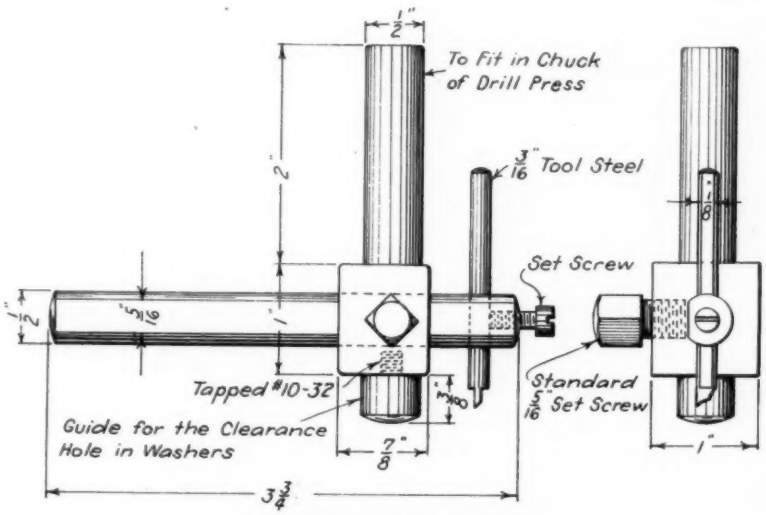
Arkansas Association of Electrical Contractors Organized.

At a meeting of electrical contractors from all parts of the state of Arkansas, at Hotel Marion, Little Rock, Ark., on March 20, the Arkansas Association of Electrical Contractors, which is affiliated with the national association, was organized. In addition to 21 contractors, a number of traveling representatives of the large electrical manufacturers and a number of visiting central-station managers were also present. The constitution and by-laws to govern this association were adopted, and the following officers elected: J. C. Rush, Hot Springs, president; C. J. Dresse, Little Rock, vice-president; J. C. Dice, Little Rock, secretary; J. R. Bloom, Pine Bluff, treasurer; and W. S. Treadway, Little Rock, Ark., member of the national board of the association.

An address of welcome was delivered by C. J. Griffith, manager of the Little Rock Railway & Electric Company. B. C. Fowles, manager of the Pine Bluff Company, of Pine Bluff, and G. W. Hill, of New York City, national organizer for the association, told of the advantages and benefits which would follow the organization of the Arkansas association. In the afternoon the electrical contractors were entertained on an automobile ride to interesting parts in the city, and in the evening at a banquet and theater party.

A Device for Cutting Out Fiber or Hard-Rubber Insulating Washers.

In repair shops or electrical machine shops where a large number of fibers or hard-rubber washers have to be made up not only cheaply but where a finished article is also desired, the device illustrated herewith will prove of value. It can also be used to advantage in the tool locker of a contractor doing a large power-house or substation job, where no lathe is available for turning washers up. The usual practice is to drill clearance holes in a sheet of fiber, cut out the washers in any old shape, clamp them on a bolt and then turn up the whole lot in a lathe.



Device for Cutting Out Washers.

With this device all that is necessary is simply a drill press. It is made up of a piece of either square or round steel, turned up, drilled and tapped as per sketch, a piece of one-half-inch round steel for holding the tool, and a cutter made of three-sixteenths-inch tool steel.

The guides for clearance holes in washers are to be made up for as many size washers as may be thought necessary, only four or five sizes are generally needed. These are each fitted with a small stud that allows them to be screwed into the bottom of head. In cutting washers, first the clearance holes are drilled in a sheet of fiber, leaving enough space between centers of holes as may be required for cutting outside of each washer. The device is then put into the drill press, the guide placed in the clearance hole that has been cut out, and the tool set at the desired outside diameter of washers. They can then be cut out as rapidly as in a lathe.

H. W. Parsons.

English Central Stations and Electrical Contractors.

For some years past in England there has been an annual discussion regarding the extent to which electrical supply authorities (that is, central station and particularly municipal plants) should be allowed to do wiring and installation work. The electrical contracting firms through their organizations have been consistently determined against any infringement of their rights as private tax-paying traders by municipal corporations. The latter bodies have been equally determined that something should be done to place them in a more favorable position for carrying their parliamentary electric supply powers to their complete and logical conclusion. They complained of the handicap under which they operated as sellers of electricity if they were to be prevented from enabling the user to have the installation work in his premises facilitated.

But there is no great love between the powers in authority and the business people of England for an extension of municipal trading which shall infringe the rights of small traders. Yet it is difficult, when once the broad principle has been approved, to keep things within the originally intended limit, and at times it seems as vain as the Canute attempt to control the ocean: "Thus far shalt thou come, but no farther."

If the private contracting firms had been able to run efficient canvassing organizations cultivating a demand for electric supply business; if they were always doing good work and at reasonable prices; if good firms were available in every supply area—and so on, the question might never have arisen whether the municipal corporations should engage in such operations. And if corporations are to engage canvassing staffs to induce the public to adopt electrical service, as they must do if they are to properly fulfill their obligations, and to throw open showrooms which shall finally convince the prospective consumer, are they to throw work into the laps of contracting firms who do not try to get it in their areas?

All of these and many more points of a like kind periodically arise in the discussion of the subject and the case for co-operation is a very strong one. In past battles probably the municipal suppliers and the private contractors have gone too far in their demands and their objections. They have been urged again and again to compromise matters.

As a result of prolonged deliberations, the subject, it is hoped, has now been brought definitely to a head so that it may be cleared right out of the way, co-operative action enabling the electricity sellers, and the makers and vendors of apparatus, to conduct their businesses with full enterprise and without handicaps. The Incorporated Municipal Electrical Association has not succeeded in getting its proposals through Parliament in the past few years, chiefly because of opposition along the lines indicated above. Now it has produced a bill for the present session of Parliament and we give below the suggestions embodied in one of its sections for settling differences with the contractors:

(4) With the view to securing co-operation between any undertakers exercising the powers conferred upon them by this section and persons carrying on the business of supplying fittings (in this Act called "Electrical Contractors"), the following provisions shall apply:

(a) When the undertakers provide showrooms for the purpose of selling or letting fittings, they shall, at the request of any electrical contractor whose shop or place of business is situate within the area of supply of such undertakers, give to him when practicable reasonable facilities for enabling his customers whose premises are situate in the said area to attend such showrooms and to inspect the fittings therein.

(b) Any electrical contractor who shall, at the request, whether expressed or implied, of any undertakers, sell any fittings on their behalf, shall, subject to any agreement which may be made between them, be entitled to receive out of the purchase money paid to the undertakers, a sum calculated at the rate ordinarily allowed as discount in respect of such fittings by the makers thereof to electrical contractors, and based on the amount actually received by the undertakers in respect thereof.

(c) Any undertakers who pay a commission to the persons employed by them in respect of the sale or letting of fittings shall pay a commission at the same rate and under similar conditions to any electrical contractor upon whose introduction any fittings are sold or let by such undertakers.

(d) Undertakers shall not in the exercise of the powers of this section sell any fittings at a less price than the price (if any) which is determined and enforced by the makers of such fittings as the minimum price for the sale thereof to the class of customer to whom such fittings are sold.

(e) Undertakers shall not themselves execute the wiring of private property, except between the main of the undertakers' and the consumer's meter, but they may enter into contracts for the execution of wiring under subsection 2 of this section, provided that:

1. In making any such contracts for wiring undertakers shall not in cases where there are more than one electrical contractor whose shop or place of business is situate in their area of supply give any undue preference to any electrical contractors.

2. No undertakers shall be subject to the restrictions contained in this paragraph in any case where there is not effective competition between the electrical contractors carrying on business in the area of supply of such undertakers in regard to the execution of contracts on behalf of the undertakers.

(f) Any question which may arise between any undertakers and any electrical contractor under this subsection shall, unless otherwise agreed, be referred to an arbitrator appointed by the President of the Institution of Electrical Engineers, and the provisions of the Arbitration Act, 1889, shall apply to any such reference.

Among the Contractors.

The Gangle-Harbaugh Construction Company, Akron, Ohio, has been incorporated for $10,000, and will do a general electrical construction business. F. Gangle, C. Harbaugh, W. E. Salber, D. McDonald and R. T. Foltz organized this corporation.

Robertson & Packard, of Santa Ana, have been awarded the wiring contract for the new $100,000 Polyclinic High School at Inglewood, Cal.; their bid was $2,300. The Standard Electrical Time Company was awarded the contract for the installation of the program clocks, their bid being $930.

K. T. Bennett has been awarded the contract for the placing of ornamental lights on St. Johns Street, Pasadena, Cal., the amount of bid being $1,896.

The season's work is opening up well with Childers & Waters, Louisville, Ky., electrical contractors, and several small contracts for lighting installations have been handled by the firm lately, including one of the public schools of the city.

The A. B. Harris Electric Company, of Gary, Ind., has been incorporated under the laws of the state of Indiana for $20,000, and will continue its electrical-contracting and engineering business. This company was incorporated in order to obtain more capital and to strengthen the organization. A. B. Harris will hold the position of president and manager; while C. M. Schuman, formerly local manager of the Central Illinois Public Service Company, of Beardstown, Ill., will hold the position of secretary, and take an active part in the work of the company. W. B. Brockhouse, of Beardstown, Ill., will be one of the directors for the first year.

The N. C. Pickard Electric Company is a new arrival in Kansas City, Mo. The company has taken quarters at 1323 Grand Avenue, fitting its new place of business up elaborately.

The Shiras Electric Company, of Kansas City, Mo., has secured the contracts for the new Orpheum Theater, in Kansas City, as well as the new home of the Taylor Dry Goods Company. Each contract is worth about $90,000, and calls for wiring, heating and ventilating work. The same company also is handling contracts of the same description on the new Hotel Deming, at Terre Haute, Ind.

H. S. Little, successor to John G. Sutton Company, of San Francisco, Cal., is completing the contract for the electric installation in the addition to the Saint Francis Hotel. In addition to this contract which amounts to about $12,000, he has been awarded the contract for the Van Ness extension to the Geary Street Municipal Railroad. This contract amounts to $33,000, and consists of furnishing and erecting reinforced-concrete trolley poles.

The Sterling Electric Company, of Minneapolis, Minn., has secured the contract for the electric wiring in the new four-story Loeb arcade building. The installation consists of wiring for a lighting load of 2,000 amperes and a power load of 500 amperes.

The L. K. Comstock Company, of Chicago, Ill., has the contract for wiring the Morr Hotel of that city. About 4,300 incandescent lamps and a number of large motors will be installed.

The Priddy Electric Company, of which C. F. Priddy is proprietor, has an attractive store at 450 Pine Avenue, Long Beach, Cal., where it does an electrical merchandising and contracting business, and specializes in motor work. Mr. Priddy, whose personality is not the least factor in establishing a successful business, has had considerable practical experience in the electrical line, and is a 1911 graduate of the Bliss School of Electricity.

Banquet for Contractors.

A banquet was tendered the electrical contractors of Carbondale, Pa., by the officials of the Carbondale Electric Company. The guests met at the American House. E. T. Hollingsworth, presided. Addresses were delivered by Charles Berry, F. D. Collins, W. Y. Myers and others.

Public Service Commissions

Conducted by William J. Norton

COMPETITION IN NEW JERSEY—II.

POLICY IN WISCONSIN.

This is the second part of an article in which Mr. Norton presents a comprehensive resume of the decisions which have been handed down by the public service commissions in the various states, relating to the matter of protecting established utilities against unnecessary competition. In the summary he indicates what appears to be a reasonable commentary upon the New Jersey Utility Commission's action in the Phillipsburg case.

A fundamental decision on this question, laid down by the Wisconsin Commission in the first year of its regulation of public utilities, was rendered in the La Crosse Gas and Electric Company case (2 W. R. C. R. 3, 5).

"Duplications of such plants is a waste of capital, whenever the services can be adequately furnished by one plant only. It necessarily means that interest and maintenance must be earned on a much greater, if not twice as great, an investment and that the actual cost of operation is likely to be relatively higher. Competition in this service therefore usually means a bitter struggle and low rates, until one of the contestants is forced out of the field, when the rates are raised to the old level if not above it, or to a combination or understanding of some sort between them which also ultimately results in higher rates. In this case it often happens that the means which were thought to be the preventative of onerous conditions become the very agents through which such conditions are imposed. In fact, active and continuous competition between public utility corporations, furnishing the same service to the same locality seems to be out of the question. This has been shown by experience. Such competition is also contrary to the very nature of things. Two distinct and separate corporations are not likely to remain separate very long after it becomes clear that the services rendered by both can be more cheaply and more effectively furnished by only one of them."

In a more recent case the Commission, on its own motion, investigated the electric lighting situation in Milwaukee. The city is served by a number of competing utilities. In an attempt to secure the lighting business certain companies engaged in unjust and discriminatory practices which would lead to a rate war.

"Rate wars usually mean, for a time at least, lower than paying rates, failure to keep the plant in good operating condition, and in the long run inadequate service. They often result in financial ruin to one or more of the plants involved, the crippling of the rest, and in the ultimate consolidation of the remnants of all into one concern. When peace has in this way been restored, it is often necessary, in order to secure adequate service, to advance the rates, not only to the level which prevailed before the contest, but to even higher figures. This has been the history of rate wars from their beginning, and there is nothing to indicate that this would not be the result in these cases. If the war was permitted to go on, such results could not even be entirely prevented by the Public Utilities Law, for the only way in which ruined plants can be made to furnish adequate service is through the investment of additional capital, and this can only be had at rates that are high enough for reasonable returns. In one way or another losses and destruction due to rate wars are in the end almost certain to have to be borne by the public. In the end the customers also will lose more through bad service and higher rates than they gained through the temporary low rates which they enjoyed during the struggle. In the public utility field rate wars are so clearly against public policy that they should not be permitted under any circumstances. This is also recognized in the Public Utilities Law, for it is clearly in order to enable this Commission to prevent or stop such struggles that sec. 1897m-99 was included therein.

The Commission quotes its holding in the La Crosse case, cited above, and again states the disadvantages of competition.

"That competition in the very nature of things cannot be a proper regulator of rates and other conditions in the public utility field, would seem to be two well understood for discussion. As a real competition in this field means duplication of plants, which duplications, when once put in, are for the most part useless for any other purpose than that for which they were intended, and which duplication, unlike current capital, cannot be withdrawn from the service and used for other purposes. It also means excessive outlays for fixed and operating expenses. Again, it stands for unnecessary tearing up and occupation of already overcrowded premises, and for many other inconveniences and costs." (9 W. R. C. R. 541, 551, 553.)

OTHER COMMISSIONS.

Indiana.

In the case Hawks Electric Company vs. City of Goshen (September 8, 1913), the Indiana Commission, while stating that the application did not come under the statute requiring certificate of convenience and necessity, made this statement in favor of regulated monopoly.

"Plaintiff contends that this section (Section 98 of the Shively Spencer Utility Commission Act) is applicable to the conditions in this case. That the spirit of this act is monopolistic is clear. That a single utility furnishing a product or service, in the end leads to better service and lower prices, when properly regulated, is no longer questioned by economists."

New Hampshire.

In regard to admitting competition, the New Hampshire Commission says, in the Hudson Water Company case (July 14, 1913):

"If a utility in any case cannot meet the reasonable demands of the public for service, and some other utility can, then such other utility ought to be permitted and must be permitted to render the needed service.

"Or if a utility is in a position so that it can undoubtedly furnish service as good as that furnished by a utility already in the field, and at lower rates than that utility can serve and continue to operate efficiently, then it is entitled to permission to enter the field. . . ."

"Before granting authority for the entrance of a competing utility into territory already occupied, the Commission must determine and find, upon a consideration of all the facts in the particular case, that the community will derive advantages from the competition created which will outweigh in importance any disadvantages or evil results which may be expected to arise therefrom. The course to be pursued will vary according to the facts in each case. Sometimes they will be such as clearly to call for the admission of the applicant. *Generally, however, the situation should be met by requiring the established utility to supply service at the rate which might be secured by admitting competition.*"

In this case, the Hudson Water Company was open to severe criticism for its delay in obtaining an adequate supply of uncontaminated water. The complainants urged that the Pennichuck Water Works Company be authorized to extend its service into Hudson. However, the Commission granted the Hudson company 60 days

as a reasonable time within which to make improvements. In case the company fails to meet the necessary requirements, the decision says, the competitor may be allowed to furnish the service.

Georgia.

In the Macon Railway & Light Company case recently decided by the Georgia Commission, the decision says:

"We do not believe that a business which supplies to a community, a public utility like gas or electricity, is one in which full and free competition between two companies engaged therein, can be expected to permanently prevail. Experience has demonstrated the world over, as it has in Macon, that when there is more than one such company in a city engaged in the same business, while active competition may prevail for a while, sooner or later the competing companies find it to their interest to reach an understanding as to prices, or to a division of territory, or both, and in the great majority of cases the two companies either become one or the control of both passes into the same hands...

"We do not believe competition can ever be a consistent and proper regulator of rates and other conditions in the public utility field. Real competition in such a field means duplication of plants, which when once built, are generally useless for other purposes.

"In 1912 there was in Macon an established light and power company, with plant and capacity sufficiently large or capable of enlargement, to serve the city for many years. Instead of coming to this Commission for fair and reasonable rates or for improvement in service, if unsatisfactory; instead of taking steps to compel this established company to furnish all proper and reasonable service at fair rates, the City adopted the policy of granting franchises to another company to come in and share the business, or to compete for it. This company, before it could serve the public, had to provide itself with an expensive plant and equipment, as well as with business and operating organizations. The result is that real competition is now gone, and there is invested in these duplicate plants and organizations, in this city, much more property, much more labor, supplies and services for supplying electric light and power than is needed or would have been made with only one company, upon which, under the law, so long as bona fide devoted to public uses, the public must pay returns.

"As already intimated, it is not improbable that since both are now controlled by the same interests, one will gradually be dismantled, much of its property wasted and permitted to decay, and in some way and in the end, the public will have paid for it.

"The Commission earnestly believes that it would be wise if the Legislature would prohibit the building of duplicate public utilities, or the grant of franchises to such, prior to application to and issuance by this Commission of certificates of public convenience and necessity. In our opinion, the government which properly assumes to prescribe reasonable rates and compel adequate services by public utilities, should also protect such utilities and the public from unwise or useless competition and the wasteful investment of money in unnecessary plants..." (Decided February 24, 1914.)

California.

In the Pacific Gas & Electric Company vs. Great Western Power Company (Vol. 1, 203), the California Commission says:

"It certainly is true that where a territory is served by a utility which has pioneered in the field, and is rendering efficient and cheap service and is fulfilling adequately the duty, which, as a public utility, it owes to the public, and the territory is so generally served that it may be said to have reached the point of saturation as regards the particular commodity in which such utility deals, then certainly the design of the law is that the utility shall be protected within such field: but when any one of these conditions is lacking, the public convenience may often be served by allowing competition to come in. It has been urged in this proceeding that where a utility occupying a field has generally served such field so that the advent of a second utility would merely serve to divide the business, then if the existing utility has the ability, if it choose to do so, to furnish such territory efficiently and at as reasonable rates as can be legitimately accorded by the utility desiring to enter the field, even though it had, theretofore, charged excessive rates or given inefficient service, yet sound economy would require the authority, which has the power to regulate the rates and service of such utility, to require the existing utility to furnish such territory adequately and cheaply and to keep the second utility out. Theoretically much can be said in favor of this contention, but to attempt to apply it would, in practice, defeat the very intent of the Public Utilities Act in all cases where utilities did not voluntarily accord to their patrons those things which are their due, or, at least, would impose upon the public authorities the burden of forcing such utilities into a realization of what their proper relationship to the public is... (p. 209-210).

"Rather, do we announce the rule that only until the time of threatened competition shall the existing utility be allowed to put itself in such a position with reference to its patrons, that this Commission may find that such patrons are adequately served at reasonable rates. By announcing this principle, we hope we shall hold out to the existing utilities an incentive which will induce them voluntarily, without burdening this Commission, or other governmental authorities, to accord to the communities of this State those rates and that service to which they are in justice entitled, and to the new utilities we shall likewise hold out the incentive that on the discovery by them of territory which is not accorded reasonable service and just rates, they may have the privilege of entering therein if they are willing to accord fair treatment to such territory. We understand the certificate of public convenience and necessity to be in this State largely a precautionary measure. We have already dealt somewhat at length with the cases wherein we believe competition should be allowed, even though such competition will mainly serve to take patrons from the existing utility. If, however, a territory is completely served and the utility has, to the best of its ability, given fair treatment to its patrons, as already intimated, this Commission will be slow to permit a competitor to come into its territory..." (p. 211).

The Commission further defends its position by pointing out that they are applying this rule in a territory in a developmental period and that the same rule might not apply in the Eastern states or in territory practically covered by existing utilities.

"Competition does not necessarily become duplication unless the field covered by a natural monopoly is completely served. California has just begun her development. We have no doubt that as a rule in this State the going in of a second utility will develop a considerable amount of new business, while leaving an ample field for the existing utility..." (p. 211-212).

The position of the California Commission as laid down in this case is a departure from the well established policy of public utility commissions. It appears that the Commission has had some difficulty in holding strictly to the policy outlined in this case.

In a later decision, Oro Electric Corporation (April 29, 1913), the Commission still argues in favor of the policy above set forth. However, we find the following paragraph:

"Under this new state policy, competition between public utilities is not of itself necessarily a good thing. Whether or not it is a good thing depends upon the results which flow from it in each particular case. If just as good results can be secured by regulation and supervision under state authority of an existing utility which is a natural monopoly, so that the rates and service enjoyed by the public are as good as they reasonably could be under normal competition, the consuming public has nothing to gain by competition, while that portion of the public which invested its funds in the securities of an existing utility may have much to lose by a competitive condition, which, while not helpful to the consuming public, can be extremely hurtful to the investing public, and particularly discouraging to persons who are proposing to invest their money in the development of new utilities in this State in sections thereof where there are no existing utilities of the same character and where they are imperatively demanded for the development of the state." (Vol. II, 756.)

In this case the Commission did not adhere strictly to its stated policy but granted the company in the field 90 days in which to complete the reconstruction of its plant, and stated that in case the reconstruction work is complete, the service is adequate and the rates are as favorable as those of the applicant, the applicant will not be allowed to enter this territory. In a subsequent decision, the Commission found that the improvements made were satisfactory and the application

of the competing company was denied.

From the following paragraph taken from the Oro case it would appear that the adopted policy had not had the desired effect of stimulating the company to voluntarily give proper rates and service.

"While we are discussing this point it is well to call attention to the fact that while our decision in the Pacific Gas & Electric Company has had a substantial effect upon the rates and service of the various utilities in the State in territory not under competition, yet up to the present time we know of very few instances where utilities under no fear of competition have gone as far in the revision of their rates and improvement of their service as we feel they should. We believe that our position heretofore assumed and herein affirmed is the correct one, but if after giving it mature trial, we find that the utilities do not voluntarily under the stress of potential competition afford the very best rates and the most adequate service which it is possible for them to accord in non-competitive territory, we shall be forced to the concusion that other methods must be adopted by us to bring about this result. It may be that if the utilities of the State do not in good faith accept the doctrine which we have held applicable in return for being protected from loss of revenue by competition, and accord to all their patrons that treatment to which they are entitled, voluntarily and without compulsion either from this Commission or under competition, we may be constrained to take the view that they may not justly demand protection from us. It will not avail the utilities anything to enter into understandings between themselves whereby the exclusive territory of one will not be interfered with by another, and under the protection of such agreements maintain unreasonable rates and inadequate service with such territory. This Commission is going to secure for the public reasonable rates and good service from utilities, and as soon as it finds that the method which it has adopted up to the present time, wherein it is sought to give the public the service to which it is entitled without injuriously affecting the utility, has not brought about the desired result, we shall resort to other methods. It cannot be expected if the utilities do not keep their faith that this Commission will continue to be solicitous for their welfare when such utilities, by their disregard of the public interest, have rendered what we consider the fairest solution of this question ineffective..." (Vol. II, p. 758.)

Idaho.

The Idaho Commission has expressed its policy in the matter as follows:

"The law (Public Utilities Act) was not enacted for the purpose of creating competitive action between two or more individual corporations furnishing such service, but rather to control and regulate them so as to avoid the evil effects of monopoly; and where a utility occupying a field has generally served such field so that the advent of a second utility would merely serve to divide the business, such competition becomes an economic waste by reason of the duplication of investment, which it was and is the intention of the statute to eliminate..." (Application of B. Gustad et al. for certificate of necessity, October 16, 1913).

In the case of the application of the Swan Creek Electric Company for a certificate of public convenience and necessity the company operating in the territory was rendering service inadequate and unsatisfactory. The decision says:

"Applicant hopes, if allowed to enter the field, to destroy the income of the present company entirely and render its investment valueless. Just how this is to be done is not made clear, but assuming for the sake of argument that this can be done, we do not believe that the purpose of this statute is to encourage or countenance such action. On the other hand, if the applicant shall fail to gather to itself all of the revenue derived from the village of St. Charles, it then follows that the two companies must divide what is already a very meager income for the one company already in the field, with a loss to both companies.

"We are, therefore, inclined to the opinion that no reasonable contention can be made that the present or future public convenience and necessity require or will require the construction of an additional transmission line and distribution system in the village of St. Charles and that the application must therefore be denied." (Decided December 15, 1913.)

In the Ashton and St. Anthony Power Company case (decided November 12, 1913), the Commission is without authority to prevent the unnecessary duplication. The applicant began construction before the public utilities law was in effect and, therefore, under the Idaho law had the right to proceed without obtaining a certificate from the Commission.

In this decision, however, the Commission says:

"The Commission is opposed to unnecessary duplication and in favor of protection from competition of a company already in the field."

Furthermore the Commission criticises the policy of the California Commission in admitting competition where the service of the utility in the field is faulty or its rates unreasonable. After citing the California Commission's policy toward delinquent utilities the decision says:

"As to this latter comment, we fail to see why such a condition of the inefficiency of an existing utility or its practice of exorbitant rates should exist or be permitted to continue. Under the present law such utilities are supposed to be always upon their good behavior, and if they are not furnishing adequate service and at reasonable rates, inquiry upon the part of the Commission should be at once had and they be made to come within the requirements of the statute in this respect. The matter of rates can be investigated, and if too high can be at once corrected by the Commission. If their service is not adequate and cannot be made adequate, of course they forfeit the protection given by the statute against new utilities seeking to enter their field. The statute defines very clearly the attitude that public utilities shall assume and maintain toward the public."

In the Great Shoshone & Twin Falls Water Power Company vs. the Idaho Power & Light Company, and the Southern Idaho Water Power Company vs. Beaver River Power Company, two cases decided February 18, 1914, the Idaho Commission granted protection to the company furnishing service. The defendant, the Beaver River Power Company and its successor, the Idaho Power & Light Company, had begun construction preparatory to furnishing competing service in Twin Falls and Pocatello, respectively. The defendant claimed right to do this, without securing a certificate of public convenience and necessity, on the ground that construction in the cities in question was a part of a larger generating and distribution system, construction of which had been begun prior to the enactment of the Public Utilities Law under certain land rights and water permits granting the right to use certain of the waters of the Malad River in generating electric current to be distributed for use within a radius including Twin Falls and Pocatello. Local franchises granted by Twin Falls and Pocatello were not accepted by the defendant and work was not begun within these cities until after the Public Utilities Law became effective. The Commission, therefore, held that these franchises were subject to the Commission's approval.

"We cannot avoid the conclusion that we have heretofore reached as to the purpose of this statute, that it was enacted to avoid duplication of power plants in fields where the necessity for such duplication does not exist, thereby avoiding what is termed economic waste, and such being the case, by the terms of the statute only a limited latitude is given to such public service corporations when attempting to enter the field already served by another public utility. If such public utility desires to enter such field already served, it must apply to the Commission for certificate that public convenience and necessity require such service, and it can only enter such field after a hearing has been had before the Commission and the Commission finds that it had prior to the time the statute became effective begun actual construction work and was prosecuting such work in good faith, uninterruptedly and with reasonable diligence under a franchise granted it before the statute took effect."

The defendant is ordered to immediately desist and refrain from further constructing any equipment for the purpose of furnishing electrical energy in Twin Falls and to refrain from fur-

nishing electrical energy for any purpose within the city.

SUMMARY.

The paragraphs cited from the decisions of the various commissions may be said to represent fairly the position of the leading commissions on the question of protection from competition. With the exception of the California Commission the policy appears to be well established, and generally recognized, that where the company in the field is furnishing or can be required to furnish adequate service at reasonable rates it is entitled to protection from competition and that the public interests are best conserved by a prevention of unnecessary duplication. The California Commission is in favor of protecting a company giving adequate service at reasonable rates. Its policy in favor of admitting competition when the established company is delinquent in the matter of rates or service as a means of penalizing such company and affording a warning to other utilities having similar shortcomings is clearly on trial. The California Commission is questioning the wisdom of adhering to this policy as is shown by its own statements such as were made in the Oro case, and this policy is open to such criticism as that stated by the Idaho Commission in the Ashton and St. Anthony case cited above.

Application to New Jersey.

It is important that the question of policy in cases involving competition where the company in the field is not affording proper service at reasonable rates be further investigated before considering the recent decisions of the New Jersey Board.

Excessive Rates.

In the Ettrick Telephone Company case decided by the Wisconsin Commission, October 17, 1913, the company desiring to compete, offered a $5 rate and the rate of the company established in the territory was $15 per year. The Commission held that the "objector is entitled to a rate which will pay reasonable operating expenses, depreciation, and a fair return upon its investment, and the fact that its competitor may choose to forego its dividends, neglect the greater part of its depreciation, and pay its operators less than a living wage, do not constitute a showing sufficient to warrant the entrance of applicant into the field as a competitor of the objector. It may be that the rates of the objector are excessive, but if they are, it will not be difficult for its subscribers to bring the matter up before this commission for determination..."

Should a similar case come before the New Jersey Board the same holding would apply. Under the New Jersey law the Board is given the power to fix rates just and reasonable. (See II, Ch. 195 Laws of 1911, paragraph 16 c.)

Inadequate Service.

The Wisconsin Commission has also said: "If it should be claimed that it (the company furnishing the service) does not keep its line in condition to give good service....the remedy to be sought is through a proceeding before this Commission to compel adequate service. (Owen Telephone Company, January 19, 1914.)

"Every company acting in good faith is entitled to a reasonable time within which to promote and complete the project for which an indeterminate permit is granted. This is in harmony with the spirit of the law as expressed by the supreme court in Calumet Service Company vs. Chilton, 1912, 135 N. W. 131, 144. In that case an operating company discontinued service for a period of several months because of insufficient revenue to maintain the plant, which was occasioned by the city council refusing to continue the contract for the lighting of the streets and public buildings of the city. The city attempted to construct a plant for municipal purposes and rested its right to do so upon several grounds, one of which was that the company had temporarily ceased to operate its plants. The court, speaking through Justice Marshall, says:

"'The words "operating under an existing permit" do not suggest necessarily, in continuous operation, absence of momentary or reasonable cessation. Excusable, temporary suspensions, involving no purpose to abandon, the owner being willing and reasonably, under the circumstances, able to resume and doing so, as in this case, satisfied the calls for a "public utility operating under," etc. The law must be given a reasonable,—sensible,—construction, at all points, to the end that the legislative intent shall not fail, instead of looking with favor upon technical assaults upon it.' (In re Interstate Lt. & P. Co. et al., October 21, 1912.)

"In the absence of clear proof that the company already rendering the service does not and can not do it adequately it is difficult to see how the Commission can find that public convenience and necessity warrant the new line." (Ettrick Tel. Co., October 17, 1913.)

The New York Commission decided in favor of regulation of the utility in the field in the Antwerp case.

The service of the Antwerp Company was shown to be inadequate. The Northern Power Company applied for authority to supply electric service in Antwerp. Upon the filing of this petition the Antwerp company took steps to increase its facilities by adding steam power and in negotiating for more water power. The Commission held that it should be given a chance to make its service adequate. The decision says:

"The town of Antwerp is supplied at present by the Antwerp Light and Power Company, which opposed the application of the Northern Power Company. The present service was shown to be inadequate and unreliable, as it depends upon water power which fails during dry seasons. But the company showed that since the filing of this petition it had taken steps to increase its facilities by adding steam power, and also is negotiating for more water power. The Commission therefore finds that it should be given a chance to make its service adequate, and that competition by the petitioner, the Northern Power Company, should not be allowed."

The policy of the New York and Wisconsin Commissions could be applied by the New Jersey Board under similar circumstances in New Jersey. The Board has been given the power to require any public utility to provide and maintain safe, proper and adequate service. (Sec. III, paragraph 18c and Sec. II, paragraph 17b.)

RECENT NEW JERSEY DECISIONS.

The application of the Jersey Power Company for authority to issue stock was before the Commission at the same time the Phillipsburg case was under consideration.

The Commission objects to the application chiefly on the ground that the company proposes to transmit over its system, for the construction of which the bond issue is desired, electric current which is to be generated by the Jersey Corporation at Boonton. This Corporation is not under the jurisdiction of the Board and, the decision says:

"It appears to this Board that a security issue cannot be said in the language of the statute 'to be made in accordance with law,' when said issue contemplates a purpose which, if consummated, renders the law regulating public utilities inoperative."

The application, moreover, would involve competition with the Morris and Somerset Electric Company and on this phase of the situation the decision says:

"The same grounds that would warrant the Board in withholding its approval of a franchise which should create competition locally between public utilities might be cited as grounds for the disapproval of the purpose of a security issue which would result in similar local competition between public utilities.

"It is to be noted in all of the three decisions quoted above (the Atlantic Highlands case, the Millville case and the American Telephone & Telegraph case) that the immunity from competition of the company in possession is rested upon its rendering adequate service at a reasonable price.

"Do the circumstances in the petitioner's case render its position so exceptional as to justify a departure from the Board's rule as regards utility competition locally?

"The Board is unable so to find. For, first, the petitioner is physically able to transmit current to the Morris County Traction Company without entering with transmission lines and substations into territory already locally supplied with electric current. * * *

"Moreover there is force in the posi-

tion that if the petitioner once enters the territory adjacent to Morristown, the petitioner may be solicited to take on local business without the legal right to refuse. * * *

"This is a form of competition to which the Morris and Somerset Electric Company may reasonably object. The intervener, it appears, is giving adequate service throughout the district it serves. There is no complaint either of its service or its prices. * * * It replaced the inadequate electric lighting service formerly given in Morristown. It experienced for a time local competition therein to its own and to the public's detriment. It has paid dividends on its stock only for the past two years. Its physical equipment and its financial ability are adequate to cope with a considerable extension of electric business; and, if required, to take on the supply of this traction company. In this respect, it clearly differs from the Fitchburg and Worcester companies cited in Mass. Pub. Doc. No. 35, Jan., 1910. When, and if a case arises that shall disclose a public utility, a would-be invader of territory locally supplied, not legally disqualified from affording service in such territory, and capable of according service that cannot be matched in character or price by public utilities already affording the local supply of such service, this Board will consider whether the circumstances warrant a departure from the precedents already established by it in reference to competing service locally by public utilities. The present petitioner's case does not seem to come within the exceptional character indicated * * *."

The Phillipsburg Case.

The Phillipsburg Light, Heat and Power Company applied to the Board for approval of an ordinance passed by the common council of Phillipsburg granting the applicant the right to furnish electric service in Phillipsburg. The applicant company was organized by a group of men, all of whom belonged to the local board of trade, but outside of the regular activities of the board. Electric service is supplied in Phillipsburg by the Eastern Pennsylvania Power Company of New Jersey. After citing the Board's policy in regard to admitting competition the Board says:

"It was made clear to the petitioners in the case at bar that they must establish affirmatively that the service in Phillipsburg fails to conform to the standard of being safe, adequate and proper.

"On careful consideration of the record, the Board is of opinion that the petitioners have established this fact. * * *

"The Board is not unmindful that in the early part of last year the generating plants in Easton were crippled for a time by a strike. Nor is the Board unmindful that some of the petitioner's witnesses have admitted subscribing to stock in the newly projected company. * * *

"Much of the irritation with the inadequate service is founded on a prevalent feeling that with the generating plants in Easton, and with only a suboffice or agent in Phillipsburg, the Phillipsburg service is not accorded proper attention * * *."

Testimony was introduced by the Eastern Pennsylvania Power Company to the effect that additional generating apparatus is being installed at Easton and that a comprehensive plan of transmission and distribution lines are being devised which will include Phillipsburg, along with other places at which current is to be delivered from the Easton generating plant.

"Counsel for the Eastern Pennsylvania Power Company, while averring that ample power will be available shortly, does not hold out the prospect that the changes in the transmission and delivery lines in Phillipsburg will be completed until October of this year.

"The question arises whether a company holding a franchise and under legal obligation to furnish at all times safe, adequate and proper service may defer or postpone rendering such service or postpone putting its apparatus in proper condition to render such service, until a more convenient season when the locality to be served shall have been embraced within a comprehensive scheme of reconstruction allowing such service to be afforded.

"We do not believe that such postponement or delay is justified or justifiable.

"We shall therefore approve the franchise under consideration as necessary and proper for the public convenience and as safeguarding the public interests."

In granting the franchise the condition is exacted that the Phillipsburg Company file with the Board its written statement that it will construct and maintain its plant for the generation of electric current in Phillipsburg, and that it will begin the construction of said generating plant within six months from the date hereof, and of its lines of poles and wires within nine months from the date hereof, and that it will have completed, unavoidable accidents excepted, its generating plant and the main lines of its distribution system "within 18 months from the date hereof."

In the New Jersey Power case the Board asks: "Do the circumstances in the petitioner's case render its position so exceptional as to justify a departure from the Board's rule as regards utility competition locally?" and in that case the Board gave a negative answer. If the Board had asked the same question in the Phillipsburg case what would have been the circumstances "so exceptional as to justify a departure from the Board's rule?"

The reasonableness of the rates of the Eastern Pennsylvania Company is not questioned, and in case the rates are excessive the Board has the right in a proper proceeding to order their reduction.

The service has been and was inadequate according to the Board's finding, but there is no holding to the effect that the company is unable to furnish adequate service and cannot reasonably be required to do so. According to the company's statement, which is not questioned by the Board, it will be in a position to furnish adequate service in *eight months*. The Board objects to the delay and authorized the new company to give service, granting *eighteen months* in which to get ready.

The decision fails to point out any advantage to be gained to offset such well recognized disadvantages as are cited by the Board in the Atlantic Highlands and Millville Gas cases and yet in the Phillipsburg case the Board has admitted competition which "would threaten or seriously impair the legitimate investment now existing (in the property of the Eastern Pennsylvania Company) * * * and by implication every investment similarly circumstanced in this State." (Millville Gas case.)

The reason for rendering such a reactionary decision in this particular case does not appear from an analysis of the laws affecting such action nor from a comparison of this case with other decisions rendered by the New Jersey Board or the Commissions of other states. Judging from the concluding paragraphs, the Board rendered this decision *contrary to its best judgment*. Leaving out of consideration the effect of this order on the company serving the city, there is still to be considered the best interests of the promoters of the new company and the consuming public.

The Board in granting approval of the franchise seriously questions the estimate of cost and earning power of the new company.

"In case the petition for the approval of stock to finance the new company had embraced the issue of bonds, it would have been a serious question whether this Board's approval of bonds could have been granted. The stockholder takes a risk with his eyes open, and we do not feel disposed to say that he may not take such a risk."

Following this warning to stockholders the Board concludes the decision with warning and advice to the interested public.

"We suggest, however, to the petitioners in so far as they represent a civic and not a commercial movement, and to the town of Phillipsburg, that now they are legally competent to provide their own supply of electric current, it might be well to consider whether prompt amendment may not be exacted of the Eastern Pennsylvania Power Company as regards service; and whether—provided such amendment is secured—*the service and the price thereof for the future may not be more advantageous, secured from the larger generating unit at Easton than locally provided.*"

INDIANA.

Extensions of Service. The Commission dismissed the application of the Citizens Gas Company for authority

to put into effect a form of contract, applying to extensions of service to remote parts of the company's territory, which specified that consumers pay the total initial cost of extending mains, such payments to be refunded when the income from these consumers had reached the amount it cost to place the mains. The Commission held that the utility law prohibited such private contracts with individuals and that the general method to follow in such cases was for the company to make extensions at its own cost, wherever practicable. In an informal ruling, the Commission held that a similar contract between the Indianapolis Water Company and an individual consumer was invalid, and the company refunded the amount paid by the consumer for the extension to his service under the contract in question.

Court Decision. The City of Valparaiso granted a contract to the Citizens' Light, Heat & Power Company whereby electric service was to be rendered the city at rates lower than those offered by the old company, the Valparaiso Lighting Company. This contract was entered into subsequent to the enactment of the utilities law and the Valparaiso Company appealed to the court. The Superior Court decided in favor of the applicant, holding that the change in rates, and the contract between the municipality and the company, are subject to the approval of the Commission. It was urged by the Citizens Company against the applicant that the majority of the officers and directors of the Valparaiso Company do not reside in Indiana, as required by the public utilities law. On this point the court held, in effect, that no legislature could pass a law which would require "individuals to sell their property—in this case their stock, or change their residence, in order to continue in the enjoyment of that which it was lawful for them to hold when they purchased."

ILLINOIS.

The Western United Gas & Electric Company has applied for authority to change rates for electricity and for permission to adopt and put into effect certain rules and regulations concerning discounts to the United States Government, cities and villages.

The Pitcher Telephone Company of Warren has applied for permission to change telephone rates.

The City of Villa Grove and the Central Illinois Public Service Company came to an agreement in the matter of rates to be charged for city, street, residence and commercial lighting service, for the period to March 1, 1915. Upon notice of this agreement between the parties the Commission dismissed the complaint of the city against the Public Service Company.

The Springfield Light & Power Company was granted permission to build a transmission line across the right of way of the Wabash Railroad Company in Springfield.

Conference With Telephone Utilities. The Commission has held a conference with representatives of telephone companies for the purpose of discussing the Public Utilities law in its relation to telephone companies. Similar meetings will be held with representatives of other utilities under the jurisdiction of the Commission.

MASSACHUSETTS.

The Board of Gas and Electric Light Commissioners has approved the issue of 300 shares of additional capital stock at par, $100, by the Blackstone Electric Company, Blackstone, Mass. Since its original stock was issued the company has made additions aggregating about $30,000.

The Public Service Commission made an investigation upon its own motion of the practice of the New England Telephone & Telegraph Company in the matter of charging for long distance telephone calls where the company is unable to locate the party called. The company has consented to abolish, after April 1st, all charges for such incomplete calls.

MISSOURI.

Uniform System of Accounts. The Commission has issued a notice of a hearings in the matter of adopting a uniform system of accounts for electrical, gas, water and heating utilities, both private and municipal. The utilities are to file any objections they wish to make, on or before April 10, and the public hearing is to be held April 15 in Jefferson City.

Joint Use of Poles. Mayor F. L. Ludermann, of Sedalia, Mo., has filed an application with the Public Service Commission asking for an order compelling the light, telephone, traction, telegraph and other companies of Sedalia to separate on different poles dangerous and non-dangerous wires.

NEW YORK.

Telephone Rates in New York City. The joint legislative committee appointed last year to investigate the matter of telephone rates for New York City has presented a preliminary report claiming that the rate should be five cents per message or below. The Committee asks for an appropriation of $50,000 to continue its work. It desires to appear before the Public Service Commission of the Second District which has taken up complaints asking for a reduction in the telephone rates for New York City.

Deposits. Hearings will be held by Commissioner Maltbie for the Public Service Commission, First District, beginning March 27, for the purpose of determining whether the Commission shall order gas companies to pay interest annually on deposits made by consumers, to keep accurate accounts thereof, and to take any other steps necessary to protect the interests of such depositors. The law now permits gas companies to exact from consumers a small deposit at the time the meter is installed. It requires companies to pay interest at 6 per cent on such deposits, but there is no provision for annual payments and it has been the practice of companies not to pay such interest until the consumers either stop the service or change residence. Preliminary inquiries made by the Commission show that the gas companies in the First District, at the close of the year 1913, held $3,537,-173.31 of such deposits, exclusive of accrued interest.

The United Electric Light & Power Company is before the Public Service Commission, First District, in a determination of proper riders dealing with the matter of wholesale rates and tenants' sub-meters. It is proposed to charge 75 cents per month per additional meter of three kilowatt capacity or less and $1.00 per meter of larger capacity, in all cases where additional or sub-metering is required by the owner or lessee.

OHIO.

Valuation Order. All public utilities and interurban railroads operating or holding property within the State, except messenger and signalling companies, are required to furnish the Commission with inventories and complete detailed valuations of all property used and useful for the service and convenience of the public. The order contains an outline of the information desired. The appraisals are to be made as of date July 1, 1914 and are to be filed on or before the first day of August, 1914.

Standards of Gas Meters. The Commission has given notice of a tentative order fixing the standard of accuracy of gas meters and providing for the testing of such meters, and fixing the standards of purity and heating value of gas.

Gas Merger. The Commission approved a contract of the Columbus Gas & Fuel Company with the Ohio Fuel Supply Company whereby the former will control approximately four-fifths of the gas distributing business in Columbus.

Electrolysis. The Commission held that it did not have jurisdiction to make orders preventing electrolysis of

gas and water pipes by escaping currents from electric railways or electric wires. The Commission was asked to review an ordinance passed by the City Council of Findlay, prescribing certain equipment to prevent escape of current causing electrolysis. The gas and water utilities urge the adoption of similar ordinances in all cities of the state.

VERMONT.

Telephone Rates. A reduction in telephone rates has been ordered affecting the rates of the New England Telephone & Telegraph Company; three of its subsidiaries, the Vermont Telephone & Telegraph Company of Montpelier, the Franklin County Telephone Company of St. Albans, the Champlain Valley Telephone Company of Brandon, and one independent company, the Springfield Local Telephone Company of Springfield. Toll rates were not modified. The New England Company intends to appeal from the Commission's order.

WISCONSIN.

Wisconsin Railway, Light & Power Company. To enable the company to offer a certain amount of its bonds in small denominations, the Commission authorized the issue of $10,000 par value of five-per-cent first mortgage and refunding gold bond certificate payment of which is to be secured by a pledge of a like amount of the company's five-per-cent bonds.

Gilmanton Mill & Electric Company. The Commission denied the application of this company for an increase in rates stating that because of the short time during which the company had been operating, conditions were such as not to warrant a general increase in rates. Considerable difficulty has been experienced through the lavish use of power by flat-rate consumers. The company was permitted to make rules regulating the use of all-night lights and flatirons, and was allowed to require violators of such rules to install meters at their own expense. A further ruling of the Commission was to the effect of exempting the utility from the necessity of supplying meters at its own expense. The Commission stated that an application for increase in rates would be entertained as soon as the utility was in a position to definitely ascertain the cost of operating the plant.

The August Light & Telephone Company was authorized to issue $3,140 of stock, the proceeds of which are to be used to reimburse the company for expenditures made during the year 1913, for additions, improvements and extensions to its plant and partly for further additions, extensions and improvements to be made to the plant.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 200.—ELECTRICALLY OPERATED PHONOGRAPH.—Is any phonograph on the market in which winding of the spring is automatically done by a silent electric motor whenever the spring tension gets down to a certain point? I believe several patents have been issued on electromagnetic release for a brake that stops the disk when the record has been played; has any device of this kind been applied to any phonograph on the market?—M. P. C., Jackson, Mich.

No. 204.—HIGHEST VOLTAGE.—What is the highest known voltage ever developed in any electrical apparatus?—M. L., Oak Park, Ill.

No. 210.—VOLTAGE DROP IN ARC LAMP.—What is the voltage drop across the arc of an open-type direct-current arc lamp using 30, 40 and 50 amperes? Also the voltage drop in an open alternating-current arc using the same currents.—J. S., Sagamore, Mass.

No. 211.—INDUCTION MOTOR ON UNBALANCED CIRCUIT.—A three-phase induction motor is operating at constant load on a delta circuit from which a lighting circuit is tapped off of one phase. The voltage on this phase is hand-regulated from 10 per cent buck (during the day) to 10 per cent boost (during the night); the other phases are left to shift for themselves. How does the current of the motor vary in each of the other phases? How does the power-factor vary? How does the efficiency vary?—C. E. R., Menominee, Mich.

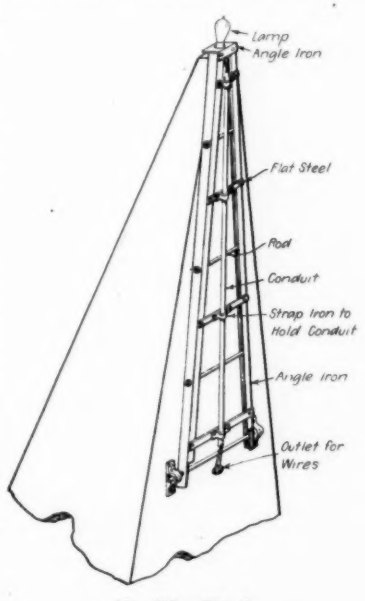
No. 212.—AMMETERS FOR THREE-PHASE CIRCUIT.—How should three ammeters be connected on a three-phase 2,200-volt switchboard when only two current transformers are available?—F. S. H., Calgary, Alta., Canada.

No. 213.—ELECTRIC MOTORCYCLE.—Is there on the market at the present time an electrically propelled motorcycle or quick-delivery car? If so, please describe same briefly and give manufacturer's address.—A. J. L., Hazelton, Pa.

No. 214.—ALLOWABLE LOAD ON LIGHTING CIRCUITS.—On account of the practically universal use of tungsten lamps, would it not be advisable to alter the present rule in the National Electrical Code so as to allow the use of 750 watts on a circuit, which would allow three 250-watt, five 150-watt, seven 100-watt, twelve 60-watt, eighteen 40-watt, or thirty 25-watt tungsten lamps on each circuit? At the present time the Code's limit is 660 watts on a circuit, based on the use of 55-watt carbon lamps. Since the introduction of tungsten lamps it has been a matter of local interpretation of the individual inspectors regarding the number of lamps per circuit; in some localities three 250-watt lamps are allowed, in other localities two only can be placed on a circuit; the same applies to 150-watt lamps, some inspectors allowing four and others five, and yet all inspectors will pass twelve 60-watt tungsten lamps on a circuit. If this matter could be definitely settled it would do away with a great deal of argument and at the same time bring the Code up to date. The slight additional amount of current over six amperes will in no way affect the circuit wiring nor the question of danger from fuses, as it is quite universal to use the N. E. C. cartridge fuse which does not explode upon a short-circuit.—G. E. D., Newark, N. J.

Answers.

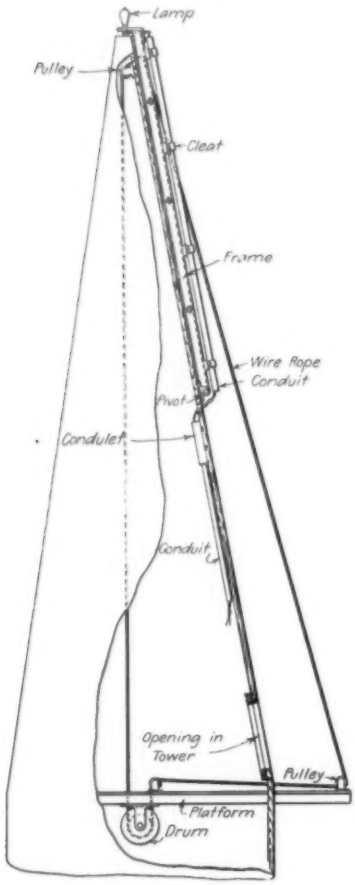
No. 199.—STEEPLE LIGHTS.—We have a proposition of putting an electric light on top of a church steeple which is extremely high. The nearest opening to the top of the steeple is 30 feet below the apex. I should like to inquire through your columns whether any contractor ever had a job of this kind and as to how he arranged things so that the lamp would be protected from hail and easily lowered for replacement, so as not to require the frequent services of a steeple jack. Being a church tower, any device installed must, of course, be of sightly nature.—F. W. R., Freeport, Ill.



No. 199.—Fig. 1.

In meeting this problem I would mount a 15-foot two-part iron frame on the side of the steeple, hinging it at the base of the frame. On this frame I

would attach a stranded wire rope at the top, which rope would run over a pulley, through a bushing into the steeple and down to the opening spoken of or lower. Another rope fastened at the top of the frame and projecting far enough from the steeple opposite the opening to give sufficient leverage would run over a pulley and into the steeple. This would provide a means of raising the top of the frame from the opening in the steeple to the top and lowering it. By using steel-armored conductor, a few condulets and a water-tight glass-inclosed receptacle with a tungsten lamp you would have the device you are looking for.



No. 199.—Fig. 2.

The method of construction and operation is made clear from the two accompanying diagrams. Fig. 1 shows the general arrangement and Fig. 2 is a partial section of the steeple to show how the ropes are run. The frame is pivoted at its base so that it can be swung through an angle of 180 degrees. The drum is used to operate the wire rope; it can be locked in any position, especially when the frame is turned up and down. The platform in the steeple has an outrigger to bring the outer pulley far enough from the steeple to give sufficient effort to start the lowering of the frame. The wire rope is endless and is arranged so that when the vertical part unwinds the horizontal part winds up on the drum. Only the main details of the outfit are shown in the illustrations.—H. E. W., Chicago, Ill.

No. 205.—Lamps for Blue-Printing Machines.—What kind of lamps are best to use for blue-printing machines, carbon arc lamps or mercury-vapor lamps? —H. I. N., St. Louis, Mo.

The light of the mercury arc lamp, although fairly rich in actinic rays, is of low intensity in comparison to that of the carbon arc. The prime requisite of a blue-printing machine is speed of operation. A carbon arc of the type usually used in blue-print machines will accomplish a given amount of work in a fraction of the time required by the mercury arc, with a corresponding saving in cost. The arc lamps usually installed in printing machines are inclosed arcs taking 6.6 to 7.5 amperes. A flame arc, however, if run on at least 15 amperes, has a much greater printing power, and its use shortens the printing time considerably. On direct current the lower electrode should be made positive and should be a flaming carbon. The upper or negative electrode should be a cored carbon of the type used in inclosed arcs. On alternating current both electrodes should be flaming carbons. The lamp in either case should burn without inclosure. In order to adapt the usual inclosed arc to the heavy current required for flaming carbons, suitable resistance must be shunted across the clutch magnets and the lamp resistance.—F. A. S., Cleveland, O.

Mercury arc lamps are especially suitable for blue printing, photo-engraving and similar work. They are rich in actinic rays and have a very steady light. When supplied with the same current used with carbon arcs they give about 40 per cent more speed. In a typical blue-print machine seven arc lamps each taking about 12 amperes give practically the same speed as when only two special mercury arc lamps each taking 15 amperes are used. The ordinary carbon arcs are unsatisfactory because they require too much time for printing.

If carbon arcs are used they must be of the intensified or flaming type, in each case requiring heavy currents from 10 to 15 amperes. Quartz-tube mercury-arc lamps have been tried for this purpose, but as yet these experiments have not been completed so as to make their use for blue printing a commercial proposition.—C. H., Chicago, Ill.

No. 206.—Short-Circuit Current.—If a short-circuit, consisting of a No. 4 copper wire, should occur across a 600-volt railway feeder of approximately 871,000 circular mils at a distance of 70,000 feet from a power plant which is the source of the current, what current would flow through the feeder and what would be the voltage at the source of supply, and how is it calculated? The power plant has a full-load capacity of 600 kilowatts with an overload capacity of 50 per cent of the full-load capacity.—J. G. M., La Marque, Tex.

In order to find the current flowing in any electric circuit, it is necessary to know the resistance of the circuit. The current flowing through the circuit is then found by dividing the voltage of the circuit by its resistance. To find the resistance of a conductor to direct current when the circular mils and length are given, divide the product obtained by multiplying the resistance per mil-foot of the conductor times the length of the circuit, by the circular mils of the conductor. Applying the above rule to the problem under consideration, we find that the resistance of a conductor 140,000 feet long and of 871,000 circular-mil area is about 1.688 ohms; and that a pressure of 600 volts will cause a current of about 355.4 amperes to flow in the circuit, provided that the No. 4 copper wire is not long enough to materially affect the resistance of the circuit. The capacity of the generating equipment will not affect the result if it can furnish the current of 355.4 amperes or more. (355.4 amperes at 600 volts equals 213 kilowatts.) Hence the voltage at the generators will not be affected provided they are flat-compounded.—P. M. B., Hudson, Ill.

The data given by J. G. M. are insufficient for a concise answer unless we take for granted certain conditions such as the following assumptions. These are: that the current is direct and not alternating; that the generators are not overcompounded; that the resistance of the rail return circuit is equal to that of the feeder circuit; that the length of the No. 4 copper wire causing the short-circuit is about 50 feet. These assumptions may not coincide with actual conditions, with the exception of the first, however, they are all such that J. G. M. can alter their values to meet with existing circumstances and thereby arrive at a correct result. It is common practice in railway work to overcompound the generator. But to allow for this would require still further data, and the error involved will not be very great. The resistance of 50 feet of No. 4 wire is negligible compared to that of the rest of the circuit, but it is taken into account so that as before J. G. M. may make such changes as he may find necessary to meet actual conditions. We have then that the resistance of the entire circuit is made up of the resistance of 70,000 feet feeder cable, or about 0.835 ohm; also 70,000 feet track return circuit, or 0.835 ohm; and 50 feet No. 4 wire, or 0.012 ohm; the total is 1.682 ohms. The current is therefore $600/1.682 = 366$ amperes. This, however, would be true only if no trains were running at the time short-circuit took place, and if no booster or substation system

were employed. In a line of the length specified these conditions will be almost certain to exist. In this event we would have to know the position of each train or car between substation and power house, the current consumed by each train, the distance from power house to substation and full particulars as to the booster system employed. These data are too complex to be assumed, and will have to be supplied by J. G. M. if he wishes a more definite answer to his question. If several trains are drawing current at different points on the line, the current will not be the same throughout different sections of the feeder, and due to the current already flowing on account of the short-circuit, might be high enough to cause the circuit-breakers to act and thereby close down the line.—A. J., New York, N. Y.

No. 207.—Connection of Current Transformers.—On an alternating-current, three-phase 2,200-volt switchboard with indicating wattmeter that has two potential and two current transformers, (A) does it make any difference in the reading of the wattmeter, if both the secondaries of the current transformers are reversed on their own transformers? If so, why? (B) does reversing the secondaries of one current transformer change the wattmeter reading? If so, why?—T. J. O. K., Atlanta, Ga.

Current transformers connected to wattmeters can have one or both of their secondaries reversed, provided that the potential coils on that same phase are reversed also. When either one current coil or one potential coil is reversed, and if the circuit is perfectly balanced, then the meter will read zero, or the sum of equal positive and negative values. When both the current coils or both potential coils are reversed then the entire reading is negative. This is best explained by saying that any meter or motor will change its direction by reversing either the shunt or the field coil, while by reversing both the shunt and the field the direction will stay the same.—C. E. R., Menominee, Mich.

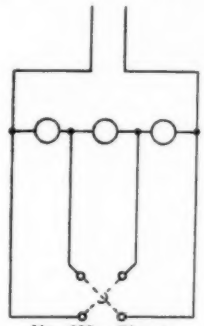
No. 208.—Motor Trouble.—I have a 40-kilowatt machine which was formerly run without trouble as a generator; now it is used as a motor, and on starting or stopping a heavy flashing occurs around the commutator, although the motor runs fine on full speed. What is the cause of this?—J. M., Kearney, N. J.

It is very evident that J. M. has not reversed the series windings in changing his generator to a motor. When he is starting up this machine as a motor, the two fields are opposing each other, and the field strength is thereby weakened, causing the flashing. This machine is likely not loaded or there would be more trouble when at full speed. Reversing the series winding will cause his motor to start without trouble and give the ability to start with more or less overloads.—W. M. P., Seattle, Wash.

As the machine ran good as a generator and still runs fine at full speed, I believe that your starting device is connected up wrong. If in starting or stopping the field is disconnected or short-circuited with the full voltage impressed across the armature, the consequent field distortion may cause high potention surges in the armature as well as the field. These surges are the cause of the flashing.—H. E. W., Chicago, Ill.

No. 209.—Series-Parallel Lamp Control.—How can I arrange a circuit to throw three lamps from a parallel to series connection and vice versa? Can this be done with only one switch?—B. T. O., Chicago, Ill.

This can easily be done by using a standard double-pole rotary snap switch, as shown in the sketch (Fig. 1), which

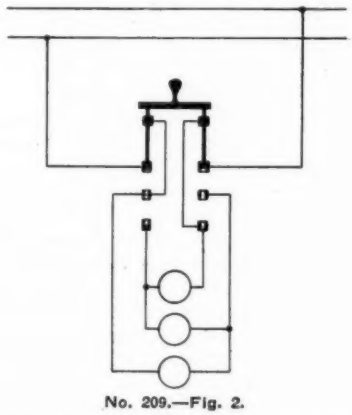


No. 209.—Fig. 1.

is self-explanatory. When the switch is open the lamps are in series; when switch is closed, they are in parallel. A single-pole switch in the main line can be used to cut the lamps off entirely; this is not shown in sketch.—J. D. H., Yonkers, N. Y.

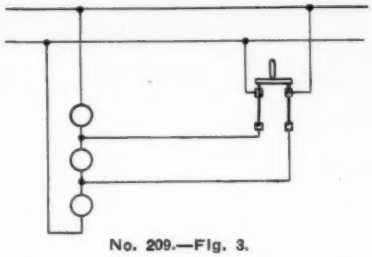
[Similar answers from F. W. B., Chicago, Ill.; C. E. R., Menominee, Mich.; R. W. E., Chillocothe, O.—Ed.]

Use a double-pole, double-throw knife



No. 209.—Fig. 2.

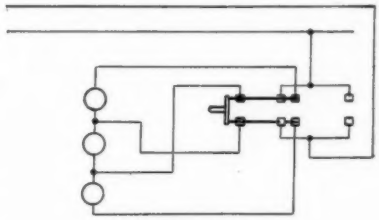
switch with an extra set of contacts between the hinges and the regular bottom clips, as shown in Fig. 2. When the switch is in the upper position the three lamps are in series; when in the lower position the lamps are in parallel; when the switch is in "off" position the lamps are not lighted.—L. B. G., Chicago, Ill.



No. 209.—Fig. 3.

[Similar answers from J. D., Cleveland, O.; F. B., Chicago, Ill.—Ed.]

The first of the two diagrams submitted herewith, Fig. 3, shows one method of meeting the requirements of B. T. O. With the double-pole knife switch closed, as represented, the three lamps will be connected in parallel to the supply circuit. With the switch open they will be in series. This method, however, would make it necessary to use another switch if it were desired to extinguish the lamps. On this account the arrangement indicated in Fig. 4 is preferable. A double-pole double-throw switch is used; closed to the right it will put the lamps in circuit in series; closed to the left, as here represented, it will put them in parallel; when the switch is open the



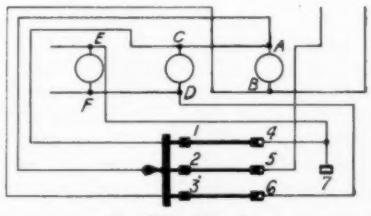
No. 209.—Fig. 4.

lamps are entirely disconnected from the circuit and even the blades of the knife switch are dead.—H. E. W., Chicago, Ill.

[Solutions similar to that shown in Fig. 3, from H. W. P., New York, N. Y.; J. H. M., San Francisco, Cal.; L. M. K., San Diego, Cal.; A. J., New York, N. Y.—Ed.]

By using a double-throw triple-pole switch as shown in Fig. 5, the change from parallel to series connection can be readily accomplished. When the switch is thrown to the left the three gaps are closed and the lamps connected in parallel. On throwing it clear over to the right the lamps are connected in series. Reversing the switch again puts them in parallel.—P. B. W., West Lynn, Mass.

[Similar answers from A. J., New York, N. Y.; P. M. B., Hudson, Ill.—Ed.]



No. 209.—Fig. 5.

MINNESOTA ELECTRICAL ASSOCIATION.

Seventh Annual Convention, Minneapolis, March 18, 19 and 20.

In accordance with its usual custom of holding its meetings alternately between St. Paul and Minneapolis, the seventh annual convention of the Minnesota Electrical Association was held at the Hotel Radisson in the latter city March 18, 19 and 20. Special commendation is due the officers of this Association for the manner in which the convention was held despite a severe handicap in the form of the resignation of Eugene Holcomb who found it necessary to retire from the presidency just prior to the time when arrangements had to be made for the annual meeting. T. P. Glidden, manager of the Consumers Power Company, St. Paul, was elected to fill the unexpired term of Mr. Holcomb and carried out the duties in an aggressive and painstaking manner.

Practically the entire morning of Wednesday, March 18, was taken up with the details of registration, the total for the morning being in excess of any previous registration. Mr. Glidden called the meeting to order shortly after 12 o'clock and explained that although he had not prepared a formal address because of his unfamiliarity with the work of the Association during the past year, he wanted to urge upon members the benefits that could be derived from the Association if all confusing problems relative to central-station practice were taken up with the Association through the office of the secretary. He thought that much work of benefit to the industry could be performed during the forthcoming year if sufficient numbers of standing committees were appointed, and if the proper care was exercised in the selection of members for these committees. Mr. Glidden then mentioned the International Electrical Congress which will be held in San Francisco in 1915, and called attention to some literature which was available in this connection.

The report of the secretary-treasurer, F. A. Otto, of the St. Paul Gas Light Company, St. Paul, was then presented and the affairs of the Association shown to be in a sound condition, both with regard to membership and finances.

At the afternoon session C. W. Drake, of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., presented a very interesting illustrated lecture entitled "Motor Applications" which dealt principally with the industries predominating in the state of Minnesota. In his introductory remarks Mr. Drake pointed out that the goal of every central station should be to obtain a load-factor of 100 per cent, and, in this connection, the power business, particularly the business having off-peak characteristics, was essential. Referring to local conditions, Mr. Drake pointed out that the last census figures showed that there was approximately 300,000 primary horsepower used in the industries of the state. In view of the rate of increase in the previous years it was safe to assume that this figure has reached about 400,000 horsepower now. Of this, Mr. Drake said that about 10 per cent was served by central-station companies in 1913 and the estimate for 1914 places the figure at 26 per cent.

In point of importance the industries which predominate are flour mills, lumber mills, paper mills and creameries. A large number of lantern slides, showing typical and unusual applications of electric motors in these industries, were displayed.

In connection with the acquisition of power business, Mr. Drake mentioned the fact that rates are not and should not be the deciding factor, as frequently, when considered on a comparative cost basis, central-station power is somewhat in excess of the cost of isolated-plant power but when increased profits are realized, without increased investment, due to the increased and uniform speed of electric motors, etc., the question of cost becomes secondary. Referring to characteristics of motors for industrial applications, Mr. Drake pointed out that practically 90 per cent of the drives commonly employed could best be met by the squirrel-cage induction motors. For the driving of machine tools, however, where variable speed is essential, direct-current motors are preferable and are gaining in favor in spite of the efforts to displace them.

At this point Hon. Wallace G. Nye, Mayor of Minneapolis, appeared at the convention and was introduced by President Glidden. Mayor Nye welcomed the delegates to the city in a very cordial manner and commented upon the strength and benefits of organizations such as the Minnesota Electrical Association. He said that organization was a great force and was only objectionable when used for selfish purposes.

R. F. Pack, general manager of the Minneapolis General Electric Company, then presented a paper entitled "Public and Public Service Corporations." Mr. Pack thought that one of the most important factors in the successful operation of a public utility was absolute frankness with the people on the part of the company. He urged strongly that in controversies of all kinds, particularly those of a political nature, the company appeal to the public for justice, explaining the facts in the case.

Mr. Pack briefly reviewed the conditions that led up to the antagonistic feeling which the public, until recently, has held toward utility corporations, and enumerated some of the present-da y policies which tend to create good will.

He strongly advocated private ownership of utilities and absolute monopoly, although regulation either local or state, is essential and central stations should publicly take a stand in favor of regulation. Speaking of taxation Mr. Pack thought that taxing utilities on the valuation of the property retards development and he advocated a tax dependent on the rate of return based upon a valuation. In conclusion Mr. Pack enumerated some of the items which he considered most important to the success of a utility company. These were good service, fair rates, no discrimination, extensions where necessary, sound financial management and no participation in politics.

Prof. W. T. Ryan of the University of Minnesota Extension Lecture Bureau then delivered an address dealing with the work of the University of Minnesota. Prof. Ryan stated that the University was going out after men who did not find it possible to take the regular courses. The manner in which this was being done was to organize classes wherever a sufficient number of students could be enrolled and send instructors to these localities to give the prescribed courses of instruction.

In connection with the work of the University in assisting central stations, Prof. Ryan called attention to the lecture bureau which is available to any company in the state at a very nominal cost. Four lectures, illustrated, have been prepared on electrical subjects which are all intended to stimulate the use of electricity and to familarize the public with some of the simpler details of central-station practice. One of the lectures which has just been completed and is now ready for use deals with the rate situation, and explains in detail the various methods of charging at present employed by central stations. The necessity for this lecture, Prof. Ryan stated, arose from the fact that the majority of customers cannot understand the methods of charging and hence assume that there is something wrong. With this in view the lecture deals, in a very comprehensive manner, with the fundamental principles of rate making. It is further simplified by the use of various charts.

Prof. Shepardson of the University added to the address of Prof. Ryan by calling attention to the relationship between the central stations of the state and the University. The University is ready and anxious to assist the utility companies through its laboratories, through the Extension Bureau in the manner mentioned by Prof. Ryan, and through co-operating in educational work in general, and, on the other hand, the University desires the co-operation of the central stations in using the graduates in the state and in making known to the people of the state the value of the University—particularly the electrical department—to the industry.

The first business taken up at the session on Thursday morning was the appointment of a Nominating Committee composed of R. E. Brown, Mankato, B. W. Cowperthwait, Faribault, and E. W. Erick, Canby.

S. E. Doane of the National Lamp Works then presented a very interesting paper entitled "High Efficiency Lamps," a considerable portion of which, however, dealt with the results of an extended trip in Europe, in connection with an investigation of central-station practice in foreign countries. In connection with the new high-efficiency lamp, Mr. Doane briefly described the theory upon which they are manufactured and the chemical action resulting from the use of nitrogen gas in the bulb. A feature of this latest development is tungsten wire coiled into a small area to reduce connection loss when operated under gas pressure to reduce evaporation. The candlepower of the new lamp is practically the same in all directions, and therefore the advance in efficiency in greater than the figures indicate. Commercially these lamps will, of course, modify central-station practice to some extent and will undoubtedly find most favor in connection with series street-lighting installations. One of the most significant developments looked for, however, is the lighting of public highways between towns served by central-station lines. It will be possible, by employing these lamps, to provide illumination at a very low figure.

Referring to conditions found in Europe, Mr. Doane said that central-station practice there has been more extreme than in this country, although there is less interchange of ideas and practice and less discussion between central stations than here. Interesting statistics were presented covering an European city of about 650,000 inhabitants where a privately owned plant was in competition with a municipal plant. The former had about 40,000 meter customers and about 25,000 customers on limiting devices. The city plant had about 24,000 customers on limiting devices, making a total for the city of over 90,000 customers. The average connected load of the 25,000 customers of the private plant is 21.7 watts. The rates cover everything from a single 10-watt lamp upwards. This single 10-watt lamp is supplied for 16 cents per month, including wiring rental, etc.

Mr. Doane referred to the ingenuous methods employed for billing and collecting consisting of making out a card with a number of coupons attached once a year, and handling this card with the coupons attached to the collector and billing the collector at each period for the total amount charged to his account. 12 of the coupons are attached if collection is to be made once a month, four if to be made once a quarter, etc. At the period named the collector exchanges a coupon for the cash. The collector in many cases are employees of beer gardens, grocery stores, etc., and work without commission.

Very inexpensive wiring devices and fixtures are used and a customer's account is carried over a long period of years. In some cases it requires only about an hour to install the wiring necessary to furnish service.

Mr. Doane stated that one of the most important features of the small customer business is the fact that as the number of customers increase there is less chance for politicians to work hardships against the utility, as it has been proved that customers of a company always take sides with it in a controversy.

Prof. Shepardson opened the discussion on this paper, pointing out that in this country the flat rate with limiting device was an excellent method for securing small customers using parts of offices, etc., but for residences the flat rate has a tendency to limit the use of heating devices and other appliances.

Mr. Doane explained that in Europe the flat rate with limiting device was used simply to obtain the very small customer and in most cases simply was considered as an opening wedge for meter business. As a matter of fact it was found there that flat irons and electric stoves were the only revenue producers for the central station, although the advertising value of the other appliances could not be ignored.

T. D. Crocker of St. Paul inquired as to the average consumption of the small customer in Europe, and also as to the possibility of obtaining inexpensive limiting devices in this country. Mr. Doane explained that he had no figures as to the average consumption, but the average price obtained per kilowatt-hour approximated seven cents. He added that the General Electric Company was at the present time developing a limiting device that will compare favorably with those used in Europe.

R. E. Brown of Mankato stated that the development of inexpensive house-wiring devices in this country would give great impetus to the securing of the small customer business, as the first cost is now the greatest obstacle to be overcome. Speaking on this subject, Mr. Doane said that the central stations have an elaborate plan for financing such installations by spreading the first cost over a period of many years, in some cases as many as ten. In this way the payments are very small in spite of the fact that the central station earns a very good rate on the money. In connection with wiring devices, Mr. Doane said that it was common practice to use a single-strand wire with copper sheath for the return circuit.

W. E. Dickerson brought out the point that central stations must strive to improve their load-factor, and it would seem that this would not be accomplished by the acquisition of a large number of small residence lighting customers. He also thought that if a very low flat rate was made to secure this business efforts would be made to reduce the meter rate by meter customers.

T. P. Glidden stated that it was apparent that the foreign companies were looking to the returns per kilowatt year and this should be the tendency in this country.

W. C. Beckforth of the St. Paul Gas Light Company then presented a paper entitled "Electrical Co-operation" by M. J. Wolf of Chicago who was unable to be present.

In this paper Mr. Wolf showed that under modern conditions of industry the old adage that "competition is the life of trade" is no longer strictly true. Under present-day conditions co-operation tends toward greater efficiency. In the electrical industry the central station must be regarded as the basis on which all other departments are to build. No one department of the industry nor one individual in it is independent of the others.

The fact that the company or individual, when purchasing, wants unrestricted competition, but, when selling, wants restricted competition, is an elementary condition, but co-operation will improve this situation and make for constructive rather than destructive competition.

Following this paper a Committee on Resolutions was appointed consisting of Messrs. Flemming, Aspnes and Bang.

The paper by F. C. Hoffman of the St. Paul Gas Light Company entitled "Accounting" was taken up at the opening of the session on Friday morning. This paper presents many very excellent suggestions for a proper system of accounting and points out the importance of uniform methods. The fundamental of any accounting system is to show the condition of the business as it really exists. It has not been long since it was thought that the central-station business could run itself and only income and disbursement accounts were kept. The wonderful development of the business, however, has led to a realization that an accounting system for central stations should not only be comprehensive but should be accurate and uniform because of the necessity for comparing conditions in various localities, and also because of the growth of regulation and the rulings of the various state commissions in this respect.

Following this paper John T. Gardiner, assistant commissioner of the State Bureau of Labor, delivered an address on safety and safety measures. Mr. Gardiner reviewed the work of the Bureau during the past few years and pointed out that its importance was emphasized by the fact that during the first two years of its existence 10,729 written orders were issued providing for various safeguards. During the past year there has been a reduction in accidents of over 28 per cent. This has been accomplished through the cooperation of both the employers and the employees, although greater co-operation is hoped for. One of the difficulties of the Bureau is to get the employees to keep in place and maintain safeguards that are provided.

One of the pleasing features of the Minnesota situation is the fact that there have been very few prosecutions because of refusal to comply with the orders of the Bureau, which shows that the industries of the state are co-operating to reduce accidents. In this connection, Mr. Gardiner thought that the standardization of safeguarding apparatus very important, as employees are frequently moving from city to city and from state to state, and frequently have to work under unfamiliar conditions. Several reports of accidents were read and Mr. Gardiner pointed out how these could have been prevented if the proper measure were employed. Among the most dangerous devices in industrial plants, which should be given special consideration, are emery wheels, set screws and protruding nails in boards.

The report of the Nominating Committee was then presented and the secretary was instructed to cast the ballot of the Association for the following candidates who were declared duly elected:

President, R. E. Brown, Mankato.

First vice-president, B. W. Lynch, Minneapolis.

Second vice-president, Alfred Horn.

Secretary-Treasurer, F. A. Otto, St. Paul.

Executive Committee, P. T. Glidden, St. Paul; F. C. Strong, Chasca; and R. F. Pack, Minneapolis.

R. E. Brown was called to the chair and the report of the Committee on Resolutions presented by E. A. Aspnes of Montevideo. This report extended resolutions of thanks to the various

R. E. Brown.

Mr. Brown, the president-elect of the Minnesota Electrical Association, is one of its charter members and has served as a member of the Executive Committee continuously since its inception. He has long been identified with the central-station industry in Minnesota, having been manager and part owner of the local gas and electric company in Mankato from 1887 to 1910. In 1910 H. M. Byllesby & Company, of Chicago, purchased the Mankato property, making it a part of the Consumers Power Company, of Minnesota, and Mr. Brown was continued as general manager, which position he still occupies. He is a member of the National Electric Light Association, American Gas Association and president of the Mankato Automobile Association, which is the second largest motor organization in the State.

speakers, to the University of Minnesota and to the manufacturers who co-operated to make the convention a success.

A. G. Munson of St. Paul spoke of the necessity for a Legal Committee for the Association to suggest legislation favorable to utility companies and particularly to suggest legislation that will enable central stations to successfully prevent theft of current. It was subsequently moved that such a committee be appointed and also a standing Committee on Meters.

The entertainment features comprised a Rejuvenation of the Jovian Order at the St. Paul Hotel, St. Paul, on Monday evening at which a class of 18 candidates was initiated into the order. At the dinner which preceded the ceremonies Mayor Keller of St. Paul acted as toastmaster and several brief addresses were delivered. At 2:30 on Thursday an inspection trip was made to the University of Minnesota and the power plant, laboratories and shops of the electrical and mechanical departments visited. The feature of this trip was the opportunity to observe the destruction of a 50-foot stack belonging to an old power house which had been replaced by a new power-plant building. The foundation had been taken out and heavy timbers substituted which were set on fire and timed so that it would release the stack when the visitors arrived.

On Thursday evening the annual banquet was held at the Hotel Radisson at which C. D. Wilkinson acted as toastmaster. R. M. Laird read a paper on the "Society for Electrical Development," following which a very pleasing vaudeville entertainment was provided. The decorations for this banquet were especially interesting representing in miniature the ornamental street-lighting system employed in Minneapolis, with a miniature central station plant at the head table. The committee having this banquet in charge, to whom special credit is due, was composed of C. D. Wilkinson, J. L. Barnard, Leo Cooper and R. M. Laird.

Several manufacturers and supply men maintained headquarters at the Hotel Radisson during the convention at which various apparatus and appliances were demonstrated. Among the companies so represented were the Adams-Bangall Electric Company, Electrical Engineering Company, General Electric Company, M. J. Grady Fixture Manufacturing Company, Detroit Fuse & Manufacturing Company, Tungsten Maintenance Company, Western Electric Company, Holophane Works of General Electric Company, St. Paul Electric Company, Northwestern Electric Equipment Company, Julius Andrae & Sons Company, Duncan Electric Manufacturing Company, Sterling Electric Company, Federal Sign System (Electric), Page & Hill Company, Wagner Electric Manufacturing Company and Westinghouse Electric & Manufacturing Company.

The wireless telegraph service of the Lackawanna Railroad proved so valuable during the recent severe storms in the East, when practically all telegraph and telephone lines were down, that it has been decided to install three new wireless stations between Hoboken, N. J., and Buffalo, N. Y. These will supplement the stations at Scranton, Pa., and Binghamton, N. Y.

Joint Meeting of Technical Societies in Wisconsin.

The second joint meeting of the technical societies of Wisconsin was held in the Auditorium, Milwaukee, on March 21. The following societies and sections of national societies participated: Milwaukee Section of the American Chemical Society, Milwaukee Company Section of the American Electric Railway Association, Wisconsin Chapter of the American Institute of Architects, Madison Section of the American Institute of Electrical Engineers, Madison Section of the American Society of Mechanical Engineers, Milwaukee Section of the American Institute of Electrical Engineers, Milwaukee Section of the American Society of Mechanical Engineers, Engineers' Society of Milwaukee, Engineers' Society of Wisconsin, Chicago Section of the Illuminating Engineering Society, Milwaukee Electrical League, Milwaukee Oto-ophthalmic Club, Milwaukee Company Section of the National Electric Light Association, Jovian Order, Verein Deutscher Ingenieure, and Wisconsin Gas Association. The registration at the meeting was 375, but there were a large number present who did not register and the total attendance could not have been less than 600.

Louis E. Bogen, chairman of the Milwaukee Section of the American Institute of Electrical Engineers, presided at the meeting. The morning session was opened by an address by George C. Bruce, secretary of the Merchants' and Manufacturers' Association. The first paper to be presented was one by Alfred O. Crozier, entitled "Cement and Clay Products Contrasted."

This was followed by a paper by R. C. Disque entitled "The Historical Significance of the 1907 Wisconsin Law for the Regulation of Public Utilities."

After pointing out the principal provisions of the Public Utilities Law, Professor Disque gave a sketch of the historical development of the idea of regulation and the evolution of the utility law. The basis of such regulation is to be found in a tract by Lord Hale regarding wharfage, which was published in England in 1787, although there were many examples of regulation of prices and wages in England before that time, as well as in the American colonies. The principal justification for such regulation was found in the necessity for it. The state interfered whenever competition or other natural causes failed to properly govern prices. Regulation does not depend upon the existence of a franchise for the operating corporation, but only upon the public nature and interest in the use of the property. A virtual monopoly is just as sufficient a basis for regulation as a legal monopoly. This was illustrated by a grain-elevator case in Illinois, where the limitation of charges was upheld by the United States Supreme Court. He pointed out that regulation was in part a legislative and in part a judicial function. Courts will decide whether a rate is reasonable but will not fix a reasonable rate. This must be done by a legislative body. Where such bodies, like city councils, are not well informed upon the subject, any attempt to regulate is likely to be unsatisfactory and it has usually been the case that the courts have had to pass upon the matter. While laws were passed in Massachusetts in 1885 and in New York in 1907 along the same lines, the Wisconsin law was the first to fully protect the interests of both sides and thereby thoroughly regulate the operation of the public utilities, although it made no change in the rights or duties of utilities, as previously recognized.

The discussion was opened by J. G. D. Mack, who pointed out that the present order of society rests on court decisions. Fortunately the judiciary of Wisconsin is not involved in politics, largely owing to separate elections having been specified in the state constitution. The ideas represented by the formation of the Railroad Commission in Wisconsin are not new, as they were largely covered by three special commissioners appointed in 1873 to report upon this subject. He considered the two strongest points of the law to be the method of appeal to the courts and the fact that the commissioners were appointive and not elective.

Messrs. Cadby, Steinberg and Schmidley, of the Railroad Commission, told something of their work, Mr. Cadby giving some figures upon the cost of the engineering work of the Commission. It was pointed out that there was no longer the antagonism toward the activities of the Commission which had at first been evident.

Edward Haase of the Milwaukee Gas Company said that the corporations were pleased with the kind of a law which existed in Wisconsin and with the kind of a commission which they have. He gave some instances from the history of the company bearing on the question of regulation.

W. B. Voth of the Sheboygan Railway and Electric Company stated that regulation had been satisfactory to the electric corporations. It was to be noted that politicians usually clamored for lower rates regardless of service; whereas the Commission has paid more attention to the quality of service and has also done a great deal in the way of education, especially with respect to metering.

Edward Bennet and M. G. Lloyd also contributed to the discussion.

Professor Disque in closing stated that regulation might well be extended beyond the field of the public utilities. The time had passed when it was regarded that the less the activities of the government the better and with the greater activity of the government we must look for greater efficiency in government processes. While it is possible to overdo government by experts, this is never so bad as government by ignorance. In either case the office holders must be watched by the agency which is the source of government.

J. C. Wilson then presented a paper entitled "The Measurement of Gases in Large Quantities." This was illustrated by lantern slides. Mr. Wilson first pointed out the need of such measurements, illustrated methods formerly in use, and then gave a description of the Thomas method, which is based upon electrical means. The Thomas meter was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, March 4, 1911.

Dinner was served at the Republican House, at the close of which an address was made by A. A. Gray, managing editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

The afternoon session convened at 3 o'clock, and was opened with some motion pictures of the control apparatus of the Panama Canal locks. These films were provided by E. M. Hewlett and C. H. Hill, who were to have read a paper upon this subject, but were unable to be present.

Street Lighting.

Arthur J. Sweet then presented a paper by himself and F. A. Vaughn, entitled "Principles of Street Lighting." The importance of street lighting was first pointed out and its relation to crime, accidents and general convenience emphasized. We are entering upon a new era in the public attitude towards street lighting, and the old standards are no longer found satisfactory. The purposes of street lighting were classified under the heads (1) safety and convenience; (2) advertising value and (3) esthetic value.

It was pointed out that discernment of objects at night was effected in four different ways: (1) by the silhouette effect of an illuminated background; (2) by the illumination of the object itself; (3) by the glint or specular reflection of the light from surfaces such as water puddles; (4) by shadows. Illumination is needed on both horizontal and vertical surfaces and the relation of the uniformity of illumination to the spacing and mounting height of the lighting units was discussed. The ratio of spacing distance to height of mounting was shown to be the important quantity affecting uniformity of illumination, and that uniformity was not altered by changing these two distances proportionately. With a ratio as high as 12, it is practically impossible to get uniform illumination, which in fact can be realized only for values of this ratio as low as 4. It can be achieved without excessive operating cost but the installation cost would be greater than is now usual. It is not, however, necessary to have perfect uniformity of illumination

in street lighting. This condition is, however, being approached in the large cities by increasing the height of mounting the lamps. Lantern-slide curves were exhibited, showing the candlepower distribution necessary to secure uniformity of illumination on both horizontal and vertical planes with different ratios of spacing distance to mounting height. The importance of glare was emphasized and curves given showing its quantitative effect upon the ability to see.

The next paper was one by John H. Smith entitled "Principles of Illumination." The author pointed out the great adaptability of the eye to the different intensities of illumination. A full moon gives about 0.028 foot-candle. This is sufficient to see fairly well, but the visual acuity is only one-quarter as great as in bright daylight. Acuity is not increased, however, by raising the intensities above 0.1 foot-candle. The importance of diffused light was pointed out and it was stated that the judgment of the user was more important in determining its value than any computations which can be made from distribution curves. Glare is often excessive from tungsten clusters in street lighting. Glare is most objectionable when it occurs in the lower half of the field of vision, since the eye has become more adapted to glare from the sky.

G. F. Ahlbrandt then presented a paper entitled "Manufacture of Pure Iron Products," which was illustrated by lantern slides. The author mentioned the various operations in the production of ingot iron and illustrated the process, which is carried out in an open-hearth furnace, but differs from the open-hearth steel process in being continued longer. The molten mass is puddled for three or four hours in order to burn out the impurities. Results of tests were given showing that the resulting ingot iron withstands exposure to the atmosphere, to fumes of gas, to salt water and other corroding influences much better than ordinary iron or steel. The importance of the lifting magnet in handling material was pointed out, the cost of loading cars having been decreased from ten cents to two cents per ton by this means.

An illustrated paper entitled "Special Operations on Machine Tools" was then presented by Mr. Wood, of the Lodge & Shipley Machine Tool Company, Cincinnati, O. This was followed by a paper by A. G. Christie entitled "Developments in American Power-Plant Machinery," also illustrated by lantern slides. Professor Christie pointed out the effect of the introduction of the steam turbine upon condenser design and operation and upon the efficiency of operation in the boiler room. This has been found not to depend so much upon boiler construction as upon draft, furnace construction, etc. He paid considerable attention to steam turbines, prophesying that the vertical turbines would soon be entirely eliminated. The General Electric Company is now turning out horizontal turbines for the large sizes, in which a combination of the Curtis and Rateau principles are combined, the latter being used for low pressure. The Allis-Chalmers Company is now putting out turbines in sizes up to 1,000 kilowatts for exhaust heating. Recent forms of Westinghouse turbines were also illustrated. Of the smaller types of turbine, the De Laval and the Kerr are based upon the Rateau principle and the Terry turbines are tending that way. He also pointed out the tendency toward motor drive for the auxiliary equipment of power houses. The locomobile, as well as the adaptation of the same idea to stationary plants, was discussed at some length. Such plants are made in sizes up to 500 kilowatts in this country and 1,000 kilowatts in Germany and are desirable where space is limited. The entire elimination of piping between the boiler and engine results in good efficiency. He closed with reference to the use of mercury as a heat agent in turbines, as recently proposed by W. L. R. Emmet.

Mr. Emmett proposes to use mercury vapor at a little above atmospheric pressure in a turbine, exhausting into a condenser with high vacuum. The condenser would be cooled by water which would be vaporized by the heat extracted from the mercury and would consequently serve as a steam boiler supplying a steam turbine. From this steam boiler or condenser the mercury would flow back into the mercury boiler by gravity. The furnace gases after leaving the mercury boiler would be utilized for heating the mercury feed, for superheating the steam and for heating the feed water for the steam boiler.

Mercury has the following advantages as a thermodynamic fluid. Its boiling point is at a desirable temperature; its high specific gravity makes possible the use of gravity feed, sealing of valve stems, etc. It is chemically neutral to air, water, iron, etc. It carries nothing in solution which would deteriorate or clog the heating surfaces. Its vapor density is high, it does not wet the blade surface nor erode it, and its volume at the condensing temperature is low, all of which are favorable in turbine design. The condenser is small compared with steam. It is estimated that by adding such a mercury boiler and turbine to an exhausting steam plant, an increase of 66 per cent in power can be delivered by an increase of 15 per cent in fuel. The output per pound of fuel would be increased about 45 per cent. About $10 worth of mercury would be required per kilowatt output of the mercury turbine.

After supper at the Republican House an evening session was held, at which Herbert N. McCoy gave an illustrated lecture on **"Radium."**

GOVERNMENT OWNERSHIP AND OPERATION OF THE TELEPHONE AND THE TELEGRAPH.

Some Illuminating Comment by President Theodore N. Vail of the American Telephone & Telegraph Company.

In the annual report of the directors of the American Telephone & Telegraph Company to the stockholders for the year ending December 31, 1913, published on March 16, there appears some illuminating information relating to the subject of the ownership and operation of telephones and telegraphs by the Government.

So much has been published respecting Government ownership and operation of the telephone and telegraph, particularly from the viewpoint of those favoring the idea, that the statement now made by Theodore N. Vail, president of the American Telephone & Telegraph Company, is of particular interest.

After reviewing the demonstrated policy of the company in "working this problem out on the broad lines of the greatest benefit to the public," Mr. Vail declares that:

"Our opposition to Government operation and ownership is not based on pecuniary or personal reasons. It is because of our interest in the upbuilding of a great public utility and its preservation. * * * * We feel our obligation to the general public as strongly as to our investing public or to our own personal interests. We believe that the efficient operation of every utility is necessary to the public, and we do not believe that any service efficient, progressive and permanent can be given by companies not making fair profits. No community can afford to be served by unprofitable or bankrupt companies which are bound to give inefficient, unprogressive service. Prosperity follows trade and trade follows the line of least resistance. Efficient facilities have more to do with serving trade than any other single factor."

That the property, if ever taken by the Government, will be found in the best possible condition, and at any valuation, that will stand, will yield much more than the present market value of the shares, is declared to be a fact. Government ownership is also opposed because it is known that no government owned telephone in the world is giving as cheap and efficient service as the American public is getting from its telephone companies, and it is not believed that our Government would be any exception to the rule.

Mr. Vail corrects a common impression that there has been submitted to Congress any report by the Postmaster-General advocating and recommending the acquisition by the Government of the wire systems of the United States. The Postmaster-General has made no such report or recommendation. A special committee of Post Office officials, designated

by the Postmaster-General has gathered certain material, and these findings have been forwarded by the Postmaster-General without comment. These findings, however, because of errors in compilation and failure to take into account materially dissimilar conditions affecting comparisons, Mr. Vail declares, are of little real value.

Declaring again the impregnable position of the company's physical property in guaranteeing to its proprietors full value in the event of purchase, Mr. Vail dismisses the idea as an utter impossibility of the Government taking over the telephone toll and long-distance lines and equipping them for a destructive competition with the telegraphs. This, he says, is so at variance with any possible standard of public or private or commercial honor that it would seem as if the very suggestion would be repudiated.

Discussing the right of property owners to claim and expect just compensation based upon a fair valuation, and commenting upon this point Mr. Vail says:

"It is neither contention nor resistance to defend the properties against mistaken assertions, freely made, 'that the plants are rubbish and the securities represent little value.' Values are not to be determined that way, such assertions cannot change cold facts. Sixteen millions of miles of wire, mostly copper, on poles or in cables and underground ducts, with the station and central-office equipment of nearly five and one-half millions of telephone exchange stations, all in good physical condition, are not rubbish and do represent value. The addition of over 460,000 telephone stations during the past year could not have been made without expenditure, and represents legitimate increase, not inflation of capital."

Mr. Vail raises the question as to the relative status of government-owned and privately-owned systems. If the power of the Government to own and operate be exercised, it becomes of the greatest importance that a right decision, based on an exhaustive study and a thorough understanding of facts, conditions and possible results, be reached. Continuing, he says:

Government-Operated Telephone and Telegraph Systems.

A thorough study of all available reports and official information on the operations of government-owned and operated telephones and telegraphs shows that while in some countries the post office proper pays a revenue, the combined telegraph and telephone are without exception operated at a deficit. Every telephone system in the world adopts the Bell System as a standard, use the Bell operating methods and either uses the Bell apparatus or copies it; yet there is not one that gives an approximation to the facilities that the Bell System gives the public, or gives as good or as cheap service on the same basis of accounting, franchise conditions, and wages paid.

"In England where the Post Office pays a very handsome net revenue, its telegraphs show a relatively much larger deficit, while the revenues and ordinary expenses of the telephone operations show a small balance, excluding, however, depreciation and obsolescence which have not yet become fully determined but which cannot be ignored.

"These deficits are not the result of a definite policy to give a cheap service to individuals at the cost of all, but are due to errors in management such as under-estimates of values and cost of new construction; disregard of maintenance, depreciation and particularly of obsolescence; impossible theories of operation, and a mistaken policy founded on promises, prophecies and assertions exactly the same in character as those now being used to bring about government ownership in this country, and upon a failure to understand and appreciate the advantages of private as distinguished from government organization. The fallacies urged in Parliament to induce the government acquisition of the British telegraph systems years ago are the arguments used by the advocates of government ownership and operation today.

Functions of Government.

"The functions of government and the causes of its being are 'Control' and 'Regulation'—control of the individual proper function of the government either to provide it or to see that it is so provided as to bring it within the reach of every individual member of society; even to provide it for all at the cost of the general revenue.

"To the extent that anything of a utilitarian nature is adopted by or assimilated into the habits of the public and contributes to their comfort, convenience, or even generally to their profit, it should become an object of sufficient government regulation to prevent the public convenience being made the cause of private exaction; the distinction between what should be furnished in whole or in part by the government and what should be regulated by the government being whether the necessity is absolute and the thing indispensable to the life, health and well-being of the individual and consequently of the community, or whether it be something contributing to or even important, but not indispensable, to the comfort, convenience and profit of the community or of the individual.

"A sufficient supply of potable water available to all is a necessity. The street-car, the electric light, the telephone or telegraph are conveniences of the highest importance but are not necessities in the foregoing sense. * * * *

Government Operation vs. Government Regulation.

"The step from government control and regulation to government ownership and operation is radical and fundamental; one which absolutely changes the character of government organization and functions. In this country there is no organization or function of the government that in any sense approaches ownership or operation in the real, large way.

"There are no sound reasons given or real advantages promised for government ownership and operation which do not apply to or cannot be secured by government regulation. Most of the 'advantages' promised and arguments used are purely hypothetical, theoretical and uncertain; they are not vindicated by the experience either of this or of any other country. * * * *

"There is, however, no reason for government ownership and operation where private initiative and enterprise are not only competent to develop, but have actually developed, these utilities to the fullest extent. * * * *

"The general stock arguments put forth for government ownership and operation are:

"Extension of benefits to a larger public;

"Abolition of selfish exploitation;

"Control of monopoly;

"Pecuniary advantages to the public through lower cost and consequently lower charges;

"Greater efficiency;

"Saving to general public rewards of private initiative.

Selfish Exploitation.

"Private enterprise is rightly said to be based on personal interest. There is no doubt as to this, but incentive to achievement along individual lines could not be suppressed without great detriment to the community at large. What would be the result if government restrictions reduced the reward or profit on initiative and enterprise to that of certain and secure business ventures? Where would be the incentive to assume risk and uncertainty, or the larger profit necessary to recoup the individual and the community for the unsuccessful ventures?

"The pecuniary reward to those who take the initiative and the risks of new enterprises must correspond to the labor and to the risk, but this reward cannot exceed the advantage to the public using the service, for the user must get in service, in some way at least, the equivalent of its cost to him. Private initiative, invention, enterprise, risk, spurred on by the incentive of reward, have changed the face of the world, and the resulting unearned increment largely constitutes the wealth of nations; without it many of the great scientific industrial developments would have remained scientific curiosities, even if they had been evolved at all.

Monopoly.

"The general tendency in this country is to the 'one system' idea of public utilities under regulation. Everyone knows the evil of duplication, no one wants two gas, water or electric lighting systems, and there is a general acquiescence in the 'single system' in each community. In no one of the utilities except the telephone, and the street cars to a slight degree but for a very different cause, does the fact whether A, B or C residing in the same community is on the same or different 'systems' make the slightest difference as to service, nor does it matter whether systems in different communities are connected or not.

"With the telephone exchange the question of those connected is vital; your service depends upon one system connecting all telephone subscribers in the same community and upon all communities being connected with each other.

"A telegraph system reaching all telegraphic points avoids physical transfers from one system to another, with the incidental delays and obstructions to good service.

"Telephone and telegraph systems operated under common control can avoid duplication by making use of the same wires.

"For practicability of management, economy of operation or efficiency of service there should be one combined telephone and telegraph system. This has been the Bell contention and this is the conclusion reached by the Post Office committee and by Congressional advocates of government ownership, who say

in substance that the telephone and telegraph should constitute one system and that a monopoly.

"Government regulation can effectually curb 'monopoly' and 'selfish exploitation' and make them useful without destroying them, by subordinating them to the public for the public advantage. Government ownership and operation would destroy individual initiative; they would create monopoly and increase and strengthen its evils by placing it in the control of officials and servants, responsible only to themselves as a political party, and parts of the organization which made or unmade the chief executives.

Operation and Regulation.

"Operation, economical and efficient, requires high organization continuously maintained, superior methods and efficient service. There must be supervision by able executives assisted by experts, all of long experience as executives as well as in the particular industry. They must have large discretionary powers, assume responsibility, and have undisputed directive authority over subordinates. It is purely administrative and executive in its nature.

"There is a very narrow margin between efficient, economical operation and waste. It is possible to have efficiency accompanied by waste, but never possible to have efficiency without responsible organization and the individual initiative, watchfulness and continuing interest which only accompany permanency and expectation of reward.

"Regulation is in the nature of a review, consideration, determination. It is judicial and advisory, not administrative or executive; a commission of regulation is analagous to a board of direction representing the public as well as the corporation, having no other object than the conservation and protection of the interests of all.

"Operation is a methodical action upon lines of a determined policy, requiring expert knowledge, experience, training, and individual interest.

"Regulation is common-sense, intelligent review and decision, based on presentation and examination of facts and conditions.

Government Operation and Efficiency.

"Theoretically there may be no reason why government operation should not be as economical and efficient as private operation, but actual constructive performance runs up against actual conditions and tangible difficulties which only experience shows how, and responsibility develops the ability, to deal with.

"Departmental officers taken from walks of life affording neither experience nor knowledge of the duties and responsibilities they are to assume, are expected to perform the various duties of their departments and also to incidentally look after their political obligations. As a rule their training better fits them for advocates than for executives, for judicial positions or as commissioners of regulation than directors of operation.

"Every new head of a department is of necessity a reformer; his average incumbency is less than four years; there is seldom any continuity of departmental policy, and never any continuity of departmental staff. The important assistants come and go with the head. A review of the operations of his department show much that could be changed to advantage; to eliminate all that is unsatisfactory and bring about effective results under the conditions and in the time available is impossible for the ablest. He starts in finding an incomplete attempt at accomplishment along a certain line of policy, and goes out leaving an uncompleted attempt along a different line of policy. The inevitable tendency is towards promise, not performance.

"The departments are run by the minor officials and the clerical force who under ordinary conditions are permanent. The officials have no responsibility in the selection of and little directive control over their subordinates. There is a premium on that finished mediocrity which leaves much to be desired and furnishes nothing upon which to base effective reprimand, enforce discipline, or cause for removal. Lack of responsibility is a handicap in the development of men; lack of accountability is a handicap on thorough efficiency; lack of opportunity is a handicap on initiative and enterprise.

"A full average of the minor heads and clerks would normally have capacity, initiative, enterprise and ambition. If any one of them develops extraordinary efficiency initiative or enterprise, he is either elbowed out of the way as disturbing the quiet, complacent habitude of the organization, or if sufficiently masterful, develops to a point where he can go no farther, and is soon taken up by outside organizations. The higher positions, honorable as they may be, are not sufficiently compensated and do not afford the permanent and remunerative positions to be had in private enterprises for similar occupations and ability."

Comparisons Between the United States and European Telephone and Telegraph Situation.

"The government-owned European telephone plants, notwithstanding the low price of foreign labor, are carried at a much higher cost than those of the Bell System and yet every one of them uses the Bell System as a model. The book value of the plant of the Bell System per station is less than 60 per cent that of Belgium; less than 75 per cent that of Austria; about 85 per cent that of Germany, Great Britain and Switzerland; and all of them government-owned.

"The capital account of the Post Office telegraph system of Great Britain, upon which interest is charged against telegraph revenue, is about $54,000,000. The amount admitted to have been spent in the plant is about $85,000,000. The admitted cost of the Post Office telegraph, including deficits in operation but without interest on such deficits, is about $150,000,000.

"The mileage of telegraph wires is a little under 320,000 miles. Based on interest-paying capital, the cost per mile of wire is $167; on actual cost of the plant, $267. The Western Union carries its plant at $98 per mile of wire. The telegraph plants of the world, mostly government-owned and operated except in the United States and Canada, are estimated at $130 per mile of wire. * * *

"There are higher individual rates for larger individual service in the United States than in other countries, but there are relatively much larger individual users of the service. There are also rates as low as or lower than in other countries. There is every economic reason why large users of the telephone in their own business and for their own profit should pay for service according to use. If this policy is to be abandoned, low rates cannot be made for the small user.

"The soundness of any policy, the 'efficiency' and 'suffiicency' and the reasonableness of charges for the use of any utility, are ultimately determined by the degree of its adoption by the public. In the United States there are 9.7 stations to each 100 population, more than double that of any other country, nearly six times that of Great Britain, over 13 times that of France, more than four times that of Switzerland. There are nearly 2,500,000 telephones in rural habitations in the United States, nearly one to every two strictly rural habitations. It is probable that more houses are connected by telephone in the United States than are reached by rural delivery. The telephone goes to the house; the rural free delivery only to the nearest crossroads for a good proportion of the houses. * * * *

"The average wages paid to the Bell operators are double the lowest and about equal to the highest rates paid by those in Europe."

Growth of the Bell System.

During the past year subscribers' telephone stations have increased until now there are 8,133,017, a gain of 676,943. These stations reach 70,000 localities or 10,000 more than the number of post offices. The total wire mileage is 16,111,011, of which 92 per cent is copper.

More than half the wire mileage is underground, the total underground plant representing a cost of $181,500,000.

The number of daily telephone connections showed a growth of nearly two million, reaching an average of 27,237,000 a day. Europe has only two-fifths of the telephone traffic of the United States.

The extension of the telephone plant during the year amounted to $54,871,856, making a total for fourteen years of $646,915,200. According to present estimates the construction for the current year will cost in the neighborhood of $56,000,000, of which the local resources of the companies will supply $25,000,000.

Large reserves have been made for maintenance, reconstruction and depreciation, and a steady improvement of service has been achieved.

The report says:

"The gross revenue in 1913 of the Bell System—not including the connected independent companies—was $215,600,000; an increase of over $16,000,000 over last year. Of this, operation consumed $75,400,000; taxes $11,300,000 or one and one-half per cent on the outstanding capital obligations; current maintenance, $32,500,000; and provision for depreciation, $37,700,000.

"The surplus available for charges, etc., was $58,700,000, of which $16,700,000 was paid in interest and over $30,300,000 was paid in dividends.

"The total capitalization, including inter-company items and duplications but excluding reacquired securities of the companies of the Bell System, is $1,390,242,470. Of this $620,127,086 is owned and in the treasury of the companies of the Bell System. The capital stock, bonds and notes payable outstanding in the hands of the public at the close of the year were $770,115,384. If to this be added the current accounts payable, $26,471,681, the total outstanding obligations of every kind were $796,587,065, as against which there were liquid assets, cash and

current accounts receivable, of $72,237,-885, leaving $724,349,180 as the net permanent capital obligations of the whole system outstanding in the hands of the public."

"We believe," continues the report, "that the valuation by the Interstate Commerce Commission when completed will confirm our repeated statements that the true value of our telephone plants is much greater than the book value."

In the case of the associated companies, excluding the American Telephone & Telegraph Company, particular attention is called to the per cent of net earnings and of dividend and interest disbursements to total plant and other assets:

Net earnings to plant and other assets 5.69%
Dividends and interest to plant and other assets 4.92%

In other words, the property employed earned less than 6 per cent per annum, and the dividends and interest paid were less than 5 per cent upon the value of the property, which could not be considered unreasonable.

Taken by itself the American Telephone & Telegraph Company shows net earnings of $40,576,746.19, an increase of $2,669,-101.93 over 1912. The total outstanding capital stock and bonds were $504,207,300, which represent payments into the treasury of over $24,500,000 more than the par value of the capital obligations.

The number of shareholders, 55,983, showed an increase of 5,686 during the year.

London Traffic.

The gross earnings of the various tube and other electric railways, motor-omnibus services, and tramways, controlled by the Underground Electric Railways Company, of London, England, amounted last year to $31,-940,000. The total pay roll amounted to over $11,750,000. Eleven hundred million passengers were carried at an average of 1-4 pence. The motor-omnibuses carried 580 millions and their earnings were $16,000,000.

Underground Telephone Communication Between Boston and Washington.

On February 17, 1914, Mr. Vail, president of the American Telephone and Telegraph Company, talked to Mr. Carty, chief engineer, over the through underground cable from Boston to New York. On February 25 Mr. Vail talked over a through underground circuit from Boston to Washington. On February 26 the through underground circuits between Boston and Washington were placed in commercial service.

These underground circuits were ordered by President Vail as a result of the isolation of Washington during the snowstorm when President Taft was inaugurated in 1909.

THE BOUNDARIES AND DIVISIONS OF STANDARDIZATION.

By Francis B. Crocker.

An experience of many years in the Standards Committee of the American Institute of Electrical Engineers and the fact that the writer has recently become president of the Electric Power Club, which has done much work in the standardization of electrical machinery, have caused him to consider the proper jurisdiction of the various organizations interested in the subject.

Fundamentally there are three broad divisions of standardization: (1) scientific; (2) technical; and (3) industrial. As true examples of scientific standards, we have the resistivity and temperature coefficient of copper. A proper matter for technical standardization is the safe temperature limits of the various kinds of insulating material. As clear cases of industrial standardization may be cited the shaft diameters and speeds of different types and sizes of electric motors. A scientific problem should be handled by the United States Bureau of Standards or the American Physical Society. A technical electrical matter should be decided by the American Institute of Electrical Engineers, and an industrial electrical question properly belongs to the National Electric Light Association or Electric Power Club.

The best way to solve the problems of standardization is not by conferences between a number of bodies acting jointly on the various subjects. Of course, co-operation is very desirable in some cases, but in dealing with many matters it is unnecessary. Standardization should be carried on in accordance with the following general scheme. First, each organization should have definite jurisdiction, within which it has full authority. Second, each organization should as far as possible confine its action within its own jurisdiction. Third, when questions arise that are on the border, or when the authority and interest of two or more organizations overlap, then conference between the interested parties should be held.

In order to determine jurisdiction, the following plan of procedure may be adopted. When any organization considers it desirable that something should be standardized, its secretary communicates that fact to the secretaries of the other bodies likely to be interested in the same subject. Communications between the standards committee is not sufficient because there may be several in one society and they may change from year to year. In most cases from the nature of the particular matter involved, it is clear that it properly belongs to a certain organization, and the others will accordingly acquiesce. In other instances, it is evident that a question is on the boundary between two bodies and they will therefore agree to co-operate in acting upon it. Of course, failure to answer such a communication within a reasonable time would be tantamount to an abandonment of any claim to the matter involved. When there is doubt or difference of opinion as to jurisdiction that cannot be settled by correspondence between parties interested, then the case may be referred to an arbitrator, for example, the director of the Bureau of Standards, or the president of one of the national engineering societies not interested. The arbitrator merely decides which body or bodies shall have jurisdiction over that subject. The actual standards are determined by said body or bodies.

The first standardization of electrical apparatus and methods was the work of the American Institute of Electrical Engineers several years before anything of the kind was done in other countries. In fact it was the first comprehensive scheme of standardization generally adopted in any branch of science, technology or industry. At first the Institute was the only body competent or willing to undertake such work and the standards were so general that they were important to almost all branches of electrical engineering. Hence there was no question of jurisdiction at that time. Now there is such specialization, with many organizations to cover the various branches. For example, the Electrochemical Society and the Illuminating Engineering Society are strong and active in their respective fields, which are more or less included in electrical engineering. These are technical bodies of the same general character as the American Institute of Electrical Engineers, and there are also organizations largely industrial, such as the National Electric Light Association and the Electric Power Club, composed of manufacturers of electrical machinery, which covers much of the same ground as the American Institute of Electrical Engineers but from a different standpoint.

On account of the very rapid differentiating and specializing in electrical science, technology and industry it would seem that some general plan is needed for present and future standardization. In some cases it is quite evident that a certain body should have sole authority over a certain subject. For example, the electrochemists as a body should certainly determine all standardization in that branch in spite of the fact that hundreds of members of the American Institute of Electrical Engineers are also interested in it. An organization of men who devote themselves to a particular subject should be able to determine standards for it more correctly and more quickly than the American Institute of Electrical Engineers. This is true even

though a committee or sub-committee is selected for its special knowledge of the subject, because the Institute as a whole is not qualified or interested to act upon the report of such a committee, however good it may be. Special subjects should be dealt with by those who live with them, so to speak, devoting their thoughts and efforts to them.

In all matters affecting standards it is of the utmost importance to give them very careful consideration. It is much better to have no standard than to have an ill advised one or to have different standards for the same thing. It is hard to rectify mistakes of this kind. In looking back over the history of electrical and other standardization, we see that the tendency has been to standardize too quickly, too often and too much. There have been dozens of wire gauges, for example. Electrical books in the English language may use the American, Birmingham or the Standard British gauges, each materially different from the other two. Many superfluous technical terms have also been introduced. Experience, therefore, indicates that we should be conservative in establishing standards. This is another reason why each organization should limit its action to those matters which it best understands. Thus fewer mistakes and at the same time better progress are likely to be made. All standardization committees should be careful not to rush in where angels fear to tread!

It is surely a mistake for any organization to reach out and attempt to standardize in any field that does not clearly belong to it. Each organization already has far more that is unquestionably within its province than it can possibly cover and new ground is being rapidly opened up. The Standards Committee and subcommittees of the American Institute of Electrical Engineers, for example, have been working very hard for two years on a revision of its Standardization Rules. The general scope is not much greater than that of the former rules, but the new ones will be much more correct and complete. Nevertheless, there are many points that it would be desirable to cover more definitely and a number of branches of the subject could advantageously be extended and important new matter added. Certainly the duty of the Institute is to cover its own particular field thoroughly before it seeks out or wanders into other fields to which its title is even questionable.

The Electric Power Club has one general Standards Committee and there are eight sub-committees, each devoted to a particular class of electrical machinery, for example, one of electrical alternating-current generators, another for large direct-current generators, etc. A great deal has been and will be accomplished, but there is much more ground than it is possible to cover properly even though the work is strictly confined as it should be to the sizes of shaft and pulley, speeds, nomenclatures, rating for different service and other matters that are industrial in contradiction to the technical or scientific.

A great deal of trouble is caused to manufacturers and users of machine tools owing to the varying types, sizes, and speeds of electric motors employed to drive them. Hence, the standardizing of motor dimensions for machine-tool drive is very desirable. It is solely an industrial matter that should be dealt with by the Electric Power Club and the National Tool Builders Association acting jointly. Neither the American Institute of Electrical Engineers nor the American Society of Mechanical Engineers should have anything to do with it, because it is clearly outside of their jurisdiction. As a matter of fact, it has been considered by committees of both of these bodies. Little has been accomplished, however, because it was thought necessary to consult all four organizations, and everybody's business is nobody's business.

Indiana Jovians Hold Rejuvenation.

The Indianapolis chapter of Jovians initiated more than 130 new members at a rejuvenation held on March 20 at the Hotel Severin.

Included in the class were Governor Ralston and Mayor Bell.

The gathering also officially launched the boom of Thomas A. Wynne, statesman for Indiana and vice-president and treasurer of the Indianapolis Light and Heat Company, for Supreme Jupiter of the Jovian Order.

In the after-dinner speeches each orator paid particular praise to Statesman Wynne. He was lauded in turn by Supreme Jupiter Matthews, Sam Hobson, Mayor Bell, John B. Cockrum, Governor Ralston and Ell C. Bennett.

There were numerous visiting Jovians on hand. They came from Chicago, Milwaukee, St. Louis, Cincinnati, Louisville, Lexington and other cities. Indiana was represented by delegations from several towns outside of Indianapolis. More than 250 remained to attend the banquet.

Jovian Rejuvenation at Dayton.

On the evening of March 21, the second rejuvenation of the Dayton Jovian League was held at Dayton, O. Following a buffet luncheon, 60 candidates were initiated into the Jovian Order.

Alternate Statesman Bybee had charge of the initiation ceremonies as Jupiter of the degree team which was composed of the following other members.

Neptune, L. K. Funkhouser; Pluto, Arthur Gibbons; Vulcan, W. W. Wollaston; Mercury, C. A. Kuebler; Hercules, E. S. Breidenback; Mars, C. B. Frankel; Apollo, A. B. Weinfeld; Avrenim, G. B. Sayer; Pluto's Imps, James A. Attwood, H. E. Long, R. R. Pleasant and John Martin.

Following the rejuvenation the candidates, together with the Dayton Jovians and visiting Jovians numbering about 120 in all, sat down to a banquet.

Statesman Thomas F. Kelly called the meeting to order and requested F. M. Tait, president and general manager of the Dayton Power and Light Company, to act as toastmaster.

Short talks were given by the following Jovians:

Past Jupiter Sam A. Hobson, E. P. Matthews, Director of Public Service Barlow, C. W. Chryst, Statesman W. W. Mumma, V. G. Apple, D. B. Howland, Arthur Gibbons.

In bringing the joviation to a close, Statesman Kelly mentioned the many benefits to be secured through membership in the order and predicted that at the next rejuvenation, to be held in the early part of May, another class of between 50 and 75 candidates would be initiated.

Section of Electric Vehicle Association Organized in Washington.

At a meeting held in Washington, D. C., on March 12 to bring together the electric-vehicle interests of that city there was a good attendance of electrical men anxious to boost this type of vehicle. As the result of the enthusiastic meeting a Washington Section of the Electric Vehicle Association of America was organized.

Frank W. Smith, president of the Electric Vehicle Association of America, made the chief address at the meeting in which he pointed out the origin, standing and work of the Association. He called attention to its various activities and particularly to the co-operative work it is undertaking with other associations. He spoke enthusiastically of the prospects of the electric vehicle and urged an active campaign in Washington to stimulate the use of electric cars. He showed the peculiarly favorable conditions existing in that city and referred incidentally to the work being done by a committee to urge the postal authorities to make use of electric vehicles in the parcel-post service.

The organization of the new section was completed by the election of officers, as follows: chairman, E. S. Marlow, manager of the commercial department, Potomac Electric Power Company; vice-chairman, R. B. Emerson; secretary-treasurer, C. J. Marsh, Potomac Electric Power Company, Washington, D. C.

Michigan Section Plans Convention-Cruise for June.

The Michigan Section, National Electric Light Association, proposes to hold its convention aboard ship this year, the date of the meeting being June 17 to 20. The plans provide for leaving Detroit at 5:00 p. m. June 17 on a Detroit and Buffalo steamer, arriving at Buffalo at 9:00 a. m. June 18. Niagara Falls will be visited and the party will embark at 3:30 p. m. on the steamer *City of Rochester* from Youngstown on June 18. A trip through the 1,000 islands on the St. Lawrence River is planned, the party reaching Toronto, on the return trip, on June 20. A special train over the Canadian Pacific Railway will convey the party to Detroit, arriving at 3:30 p. m.

The above itinerary is subject to slight change in time, but will remain substantially the same as to route. The price of tickets will be $30 per person, which will cover all traveling expenses, except meals on board Detroit and Buffalo steamer, at Niagara Falls and on train from Toronto to Detroit. The cost of the additional meals will be about $4.00.

This trip will be the finest within reach of the Michigan Section and a large attendance is expected. Herbert Silvester, 18 Washington Boulevard, Detroit, Mich., is secretary of the Section.

Proceedings of Joint National Committee on Electrolysis.

At the first meeting of the Joint National Committee on Electrolysis, held in New York City on May 27, 1913, it was decided, owing to the fact that certain national associations had not at that time appointed representatives, to have a temporary organization only, and await the meeting of the full committee before perfecting a permanent organization. At this meeting B. J. Arnold was appointed temporary chairman, and he was requested to confer with the national organizations not at that time represented on the committee.

The second regular meeting of the committee was held in the rooms of the American Institute of Electrical Engineers, New York City, on Wednesday, February 25, 1914. There were present: Messrs. B. J. Arnold, temporary chairman, C. Townley, E. B. Katte, H. S. Warren, D. W. Roper, F. N. Waterman, A. F. Ganz, W. J. Broder, A. S. Richey, P. Torchio, L. L. Elden, F. Towle, and P. Winsor. At this meeting B. J. Arnold was appointed permanent chairman of the committee.

In order that the work of the committee could be laid out, and a definite plan of action be decided upon, it was voted to confirm the appointment of the following members of a plan and scope committee, whose duty it would be to prepare a tentative plan to be submitted to the Joint Committee the following day for consideration: Messrs. C. Townley, chairman, representing the American Electric Railway Association; E. B. Katte, representing the American Railway Engineering Association; H. S. Warren, representing the American Telephone & Telegraph Company; D. W. Roper, representing the National Electric Light Association; F. N. Waterman, representing the American Institute of Electrical Engineers; A. F. Ganz, representing the American Gas Institute; W. J. Broder, representing the Natural Gas Association of America. Mr. Townley gave the following outline of the general scope of the committee, for the benefit of those representatives who had been recently appointed.

Electrolytic controversies have in the past given rise to unnecessary and acrimonious disputes, and not infrequently have resulted in litigation between the corporations concerned. The usual procedure in disputes of this kind has been for each side to employ one or more electrical experts who generally disagree as to the cause of the trouble and the remedies therefor. The dispute sometimes gets into the newspapers, occasioning unpleasant notoriety, and resulting in more or less drastic municipal action by the city government concerned. Much of this could be avoided if a body such as this committee could be created which would consider broadly the questions covered by the controversy, without attempting to pass upon the questions at issue, but to report back to their respective organizations so that in time the committee would come to be recognized as a neutral body whose decisions would be authoritative, the same as the Standards Committee of the American Institute of Electrical Engineers in connection with matters of definition and standardization. With that end in view the institute initiated the movement to organize a national body to consider the general subject, and agree upon any basic principles or methods of procedure to be followed in the case of electrolytic disputes.

The third regular meeting of the Joint National Committee on Electrolysis was held in the rooms of the American Electric Railway Association, New York City, on February 26. At this meeting the chairman reported that the invitation extended to the Bureau of Standards to participate in the work of the joint committee had been accepted, and it was voted that the bureau's representative, Dr. E. B. Rosa, be appointed secretary of the committee, and a member of the Plan and Scope Committee.

The Subcommittee on Plan and Scope presented a preliminary report, and after discussion, the following resolution was adopted:

RESOLVED, That the chairman be authorized to appoint committees as informally recommended by the Plan and Scope Committee, to collect information as outlined in the report, and that the committee on Plan and Scope be continued and requested to report further at the next meeting of the joint committee.

Chairman Arnold thereupon announced the appointment of the following committees: Principles and Definitions, E. B. Rosa, chairman; Methods and Analyses of Surveys, J. D. Van Maur, chairman; Foreign Practice, P. Torchio, chairman; and Domestic Practice, F. N. Waterman, chairman.

The following associations are represented in the Joint National Committee on Electrolysis: American Electric Railway Association, American Railway Engineering Association, National Electric Light Association, American Telephone & Telegraph Company, American Institute of Electrical Engineers, National Bureau of Standards, Natural Gas Association, American Gas Institute.

Chicago Jovian Meeting.

At the meeting of the Jovian League of Chicago, held on March 23, the resolutions previously presented, which provide for the assessment of annual dues of $2.00 for Jovians and non-Jovians desiring to join the League, were unanimously adopted.

Homer E. Niesz, statesman for Illinois and president of the League, announced that the next Chicago rejuvenation would be held on May 25.

S. A. Hobson called attention to rejuvenations which have recently been held at Dayton, O., and Indianapolis, Ind.

The meeting was then turned over to C. R. Kreider, who introduced Ernest Freeman, president of the National Electrical Contractors' Association, who spoke on "The National Association." Mr. Freeman stated that the curtailing of credit extended to contractors has helped the contracting industry by making the contractor adopt more modern and aggressive business policies. Mention was made of the bookkeeping system inaugurated by the Association and sold to the members as another of the factors contributing to the success of the business.

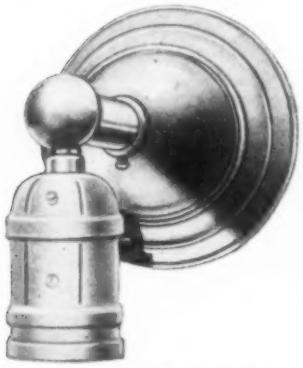
Mr. Freeman spoke of the hearty cooperation which the central stations are extending and the benefits that are being derived from this co-operation. One of the principal things occupying the attention of the Association at present is the encouragement of the enactment of state and city license laws. In conclusion Mr. Freeman stated that there were approximately 35,000 legitimate contractors and that the goal of the Association is to secure a membership of 25,000.

New Electrical and Mechanical Appliances

A New Porcelain Fixture Socket of 600 Watts Capacity.

The accompanying illustration shows a new push-button porcelain fixture socket that has been recently marketed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This new socket is of neat and attractive appearance and is well suited for use in bath rooms, laundries, and also for rooms having cement floors. It has the high rating of 660 watts, 250 volts, and is approved by the Underwriters' Laboratories. The same quick make-and-break mechanism used in C-H switches has been adopted for this socket.

A new and distinct feature is the locking ring which replaces the iron set-screw which has been used for securing sockets to fixtures for over 30 years. This new locking ring makes it possible to firmly attach C-H sockets to fixtures regardless of the varying diameters of fixture nozzle outlets and locking it in position. This new locking arrangement allows turning the socket to bring the buttons to the location desired. The porcelain casing is glazed in three standard finishes, gray, white and brown.



Push-Button Fixture Socket.

Alternating-Current Buzzer.

An alternating-current buzzer of unique construction has been placed on the market by J. G. Clemens & Company, Incorporated, 1048 Jefferson Street, Buffalo, N. Y. This buzzer is intended to be used with any suitable bell-ringing transformer and can thus be connected through it to any alternating-current lighting circuit. The distinctive feature of this buzzer is that it has no make-and-break contacts or complicated adjustments.

The essential parts of the outfit are a coil with core and an easily adjusted vibratory disk or diaphragm directly opposite the end of the core. The disk is held at the edge of a sounding cylinder which magnifies the sound and which can by a slight turn be caused to vary the sound at will. In principle the construction somewhat resembles that of a telephone receiver, but the disk actually strikes the core at each vibration, producing a loud rap in doing so.

Since the construction is so simple and is entirely devoid of electrical contacts, the life of the buzzer is believed to be indefinite. The outfit is made of cold-rolled steel with oxidized finish. It is very compact and neat in appearance. The buzzer can be used to great advantage in any place where a buzzer is needed and which is accessible to an alternating-current circuit of any frequency. The current consumption is trivial.

Time Switch In Steel Cabinet.

A New Time Switch.

A new type of time switch, recently patented, has been placed on the market, and on account of some of the unique features that it possesses it has been called the "Commonsense" time switch. The outfit consists of a high-grade clock movement especially made for this purpose; all its wheels are of heavy brass and its spindles work on steel bearings. This clock is the only thing that requires attention in the entire outfit, periodic winding being, of course, necessary. The switch is entirely independent of the clock, except at the moment when it is set for release. The switch is entirely automatic in action and does not release until the time set; however, an arrangement is included by means of which the switch can be thrown manually without opening the box. The lever and catch pin are each made of cold-drawn steel. The switch is easily pushed in and catches automatically. It is said to have a very powerful throw and to be absolutely reliable in its operation. The rating of the switch is 30 amperes and 250 volts, thus making it suitable for a great variety of circuits, including not only signs, window displays and outline lighting, but also battery charging and other purposes.

Aside from simplicity of construction and operation, probably the most important feature of this switch is that it is inclosed in a standard steel cabinet with half-inch knockouts on both sides and on the bottom. This makes this switch very convenient to install in connection with rigid iron conduit as well as flexible steel, fiber or other conduit; by using appropriate bushings it can also be connected directly with rubber-covered wire. None of the connections require to be taped with any of these installations. The dimensions of the cabinet shown in the illustration are height, 13 inches; width, 6 inches, depth, 4 inches.

The switch has been placed on the market by the Kennedy-Webster Company, 536 South Clark Street, Chicago.

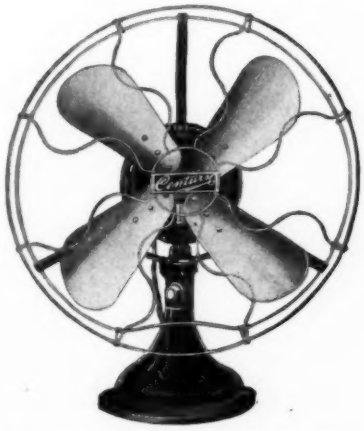
Cabinet and Switch Open.

Century Alternating-Current Fans.

The fan motors manufactured by the Century Electric Company, St. Louis, Mo., and illustrated herewith, are of the alternating-current type and pos-

sess some features which in the opinion of the manufacturer are unique and noteworthy. The two illustrations show the desk and bracket type of fans which are constructed for all frequencies between 25 and 140 cycles and for various voltages between 100 and 250 volts.

The fan motors are of the split-phase type. No moving coils are used in their operation. With the exception of the fans arranged for 133 cycles and higher frequencies, these fans require no cutout and the starting coils remain in circuit while the fan is in operation. The rotor is of the squirrel-cage type with bare copper bars located in closed slots; these bars are securely fastened mechanically and then soldered to copper end rings. The rotor core is built of high-grade sheet-steel laminations. The rotor is mounted on a shaft ground in every part to accurate dimensions, so as to produce exceptionally low friction losses and long life for the bearings. The latter are made of the highest grade of phosphor bronze and are lubricated by wick oil cups.



Nonoscillating Desk and Bracket Fan.

Oscillating Bracket and Desk Fan.

The base of the fan is of drawn steel, giving a very graceful outline, great strength and at the same time a minimum weight. On the bottom of the base is a pressed-steel plate with felt surface; this supports and protects the switch. Both the nonoscillating and the oscillating fans are provided with a swivel trunnion, by means of which they can be readily converted from a desk or table fan into a bracket fan without using extra parts; it is necessary merely to loosen the cap screw and turn the fan body at right angles to the base. By means of a positive lock on the trunnion the fan can be held in any position to which it may be tilted. The guard is held by a three-part support, one side of which grasps the top, where the fan is usually lifted. The standard finish is black enamel for the base and body, and dipped lacquered brass for the blades, guards and trimmings; special finishes can be provided.

The oscillating fan motors embody the same general features as are to be found in those of the nonoscillating type, but they also include an exceptionally reliable operating mechanism of the double worm-gear type. The steel worm and the phosphor bronze gear are of very substantial construction. They are inclosed in a grease case containing sufficient lubricant for the requirements of several years. By means of a simple device the oscillating mechanism can be thrown into or out of gear. The oscillation for a 60-cycle four-pole fan when running at full speed is at the rate of about four times per minute, which gives the best results in most cases. The range of oscillation can be varied up to about 100 degrees by shifting a crank pin to different holes located in the crank disk. By turning the fan on the swivel stud a change in the direction of oscillation can be made without further adjustment. Ball bearings carry the weight of the fan body and reduce the friction of oscillation to a minimum, even when the fan is operated at a considerable angle of deviation from the horizontal.

All these fans are made with great care from most carefully selected stock. All parts are made to fit standard jigs and gauges. Each fan receives a rigid operating test and a record is kept of its performances.

Both types of fan described are built with a maximum speed of from 1,100 to 1,600 revolutions in the 12 and 16-inch sizes, depending on the frequency; each of these fans has five speed adjustments. The fans for 133 cycles and thereabouts operate at only one speed, viz., 1,800 revolutions per minute. The power consumption of all these fans is very low and their operation is quiet.

Silver Medal Awarded for Ironclad Entrance Switches.

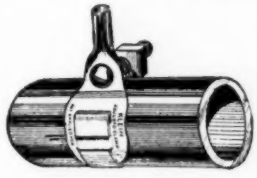
At the first International Exposition of Safety and Sanitation, recently held in New York City, a silver medal was awarded to the Detroit Fuse & Manufacturing Company, Detroit, Mich., for its exhibit of its line of ironclad fused entrance switches. These switches were described in this department in the issue of December 20, 1913. Their construction is distinctively along the lines of the "Safety First" movement. The company has also constructed a switchboard using these switches and embodying the ironclad principle of construction to even the minutest detail. It is expected to have this board on exhibition at the American Museum of Safety in New York City.

Silver Medal Awarded at Safety Exposition.

In the two accompanying illustrations are shown obverse and reverse views of the silver medal alluded to above. This award was the highest given for this line of devices exhibited.

Klein Adjusto Clamp.

The increasing requirements for grounding the neutrals and secondaries of distributing circuits has called for more attention to methods of establishing a good ground connection. A number of ground clamp devices have therefore been placed on the market, of which the one illustrated herewith has some features which are claimed by its manufacturer to constitute a marked improvement over other devices of this type. This clamp is designed for use in grounding to pipe systems or pipe grounds. It is made of solid copper, is of good construction and very easily installed.



Grounding Clamp.

The method of using this clamp is first to place it around the pipe and to adjust the bolt; the free end of the slide is then pulled through the slot until it just grips the pipe snugly; the surplus end of the

slide is then bent back and the clamp securely tightened by means of the take-up screw.

This clamp is made in three sizes to take pipes up to 1, 2 and 3 inches respectively. However, any of these sizes may be used with any smaller size pipe within its range and it may also be used with armored cable or metal molding, the convenient adjustable feature making this possible. This clamp has been placed on the market by S. Robert Schwartz & Brother, 624 Broadway, New York City.

Engine-Driven Direct-Current Generators of the Commutating-Pole Type.

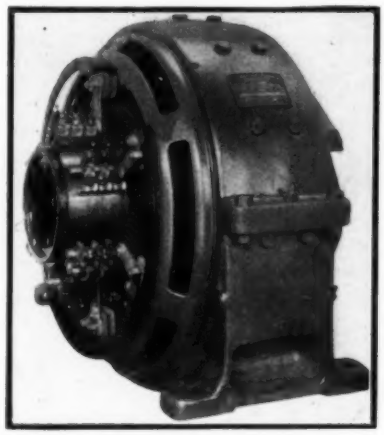
A new line of engine-type, commutating-pole, direct-current generators has been recently placed on the market by the General Electric Company. These machines embody all the advanced refinements in the electrical and mechanical design of this class of apparatus, which enable them to meet the most exacting service requirements modern applications demand. The generators are offered in the usual complete line of standard sizes ranging from 25 to 400 kilowatts, inclusive. They are manufactured in both the two-wire and three-wire types, with either shunt or compound field windings and with armatures wound to deliver the rated output at any voltage from 115 to 125 volts or 230 to 250 volts. Larger sizes of both types and wound for 250 volts only are built on specification.

The speeds of these generators are in conformity with modern engine practice, and were selected after a careful consideration of the recommendations and requirements of leading engine builders. Compound-wound machines, automatically compensating for line drop in the distribution system, are built for any desired degree of compounding from no load to full load, although four to five per cent is usually sufficient for average conditions and standard field windings provide for this amount. The frame is designed for installing on the engine bedplate or masonry foundations, and the armature is bored for mounting on the engine shaft.

The utilization of commutating poles in these generators is one of the distinctive features of the new design, and permits operation over an extremely wide range of load and voltage with fixed brush position and sparkless commutation and with a consequent increased life of the commutator and brushes.

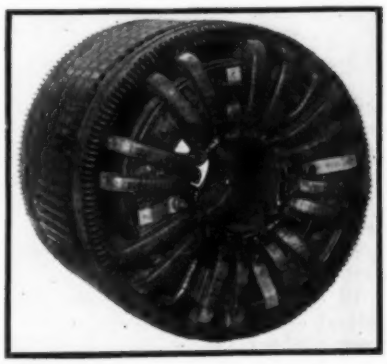
A new and very important feature of this line of generators is the development of the three-wire machines with a special type of revolving compensator. The advantages of the three-wire system for the distribution of electrical energy at low voltages are well understood.

The adoption of the revolving compensator with one collector ring for obtaining the neutral connection for three-wire operation is somewhat of a radical departure from previous designs. This design supersedes the familiar separate stationary compensator and two-collector-ring arrangement. The revolving compensator consists of a circular magnetic core upon which are mounted suitable exciting coils, the core with its coils being assembled on a cast bracket bolted directly to the back end of the armature spider. The compensator fits under the overhang and end windings of the armature, projecting but a short distance beyond the main winding, and requires no additional allowance in floor space.



Engine-Type Two-Wire Generator.

The compensator windings are connected to the main armature winding at proper points, and the neutral connection is taken through the armature spider to a single collector ring mounted on the outer end of the commutator shell. The neutral brushes bearing on this ring are supported by and insulated from the main brush-holder studs. The simplicity of this design, which is self-contained with the armature, eliminates floor space taken by the stationary compensator, requires fewer collector rings and brushes, and reduces the number of cable leads to the switchboard.



Armature with Compensator for Three-Wire Generator.

Revolving compensators may be applied and connected to standard two-wire armatures. Aside from the armature construction, the only important difference between a two-wire and a three-wire generator is in the field connections. In the three-wire generator the series and commutating fields are equally divided between the two sides (positive and negative) of the armature, insuring exact compounding for all load conditions whether balanced or unbalanced. Three-wire generators are designed to carry an unbalanced current of 25 per cent of the rated full-load current in the neutral.

Particular attention has been given to the ventilation of these machines. Armature cores, windings, spiders and flanges, commutator shells and all field coils are of open construction, allowing a free circulation of air through and around all component parts, which assures low temperatures, good efficiency and durability of the insulation. The magnet frame is of cast steel and is split horizontally above the center line, so that the generator can be taken apart for cleaning, inspection or repair without removing any of the field poles.

The main poles are of laminated steel, punched to suit the finished frame and held in place by bolts. The main field is constructed with the series coil mounted outside the shunt coil, and is separated a sufficient distance to permit thorough ventilation and insure easy access to either coil. The shunt coil is thoroughly insulated on a sheet-metal body and is supported by heavy insulating collars. The commutating poles are of rolled steel, held in place by bolts and carry a helical winding of edgewise-wound copper strip, insuring effective radiation of heat. Both the main or commutating poles with their coils can be readily removed without interfering with the magnet frame or brush rigging.

The armature windings, either multiple or series as best suits the design, are formed from bar stock in coils of the endless type, without joints or clips on the back ends, and the design of the coil is such that an exceptionally free circulation of air is obtained around and through the end windings. An improved wrapped type of insulation supersedes the trough type used on previous designs. The windings are held in the slots by hardwood wedges dovetailed in the punchings, and on the ends by binding bands, which do not, however, extend over the core.

All the end connections are supported by flanges bolted to the armature spider. Suitable equalizer connections are provided on all multiple-wound armatures to prevent any difference in voltage due to variation in the air gap, and also to equalize the magnetic pull on the shaft.

The commutator segments are made of liberal depth, from hard-drawn copper, insulated from the shell and from one

another by mica gauged to uniform thickness and of such hardness as to wear evenly with the copper. On the smaller sizes the back clamping rings are cast integral with the commutator shell, the outer clamp ring being a separate casting. On the larger sizes both clamping rings are separate castings. The commutator segments are of sufficient length to permit staggering the brushes and insure even wear of the entire commutator surface. The commutator is supported independently of the shaft, being mounted on an extension of the armature spider. The segments are connected to the armature winding by copper strips soldered into the segments and to the armature conductors.

The armature core is built up of thin laminations thoroughly annealed, assembled and keyed to a finished seat on the armature spider. Through bolts hold the assembled core in place between two cast-iron flanges, one of which is cast integral with the spider. These bolts are located within the inner periphery of the core and do not pass through it.

The brush rigging is of an improved mechanical design, the yoke fitting closely in a groove turned in the magnet frame. The brush-holder brackets are firmly attached to the yoke and are made adjustable to allow for natural wear of the commutator. The brush-holder studs are riveted in the brackets and are supplied with a liberal number of brush-holders. No shifting device is furnished nor required. After the brushes are once adjusted in their proper position, the yoke is locked in place and no further brush shift is necessary. The design of the brush-holder embodies distinctive features. The brush-holder body is a single brass casting bored for the stud fit, while the broached box offers a long bearing surface that eliminates grooving of the brush. The punched-steel lever is rigid and maintains its relation to the brush irrespective of wear. Tension is obtained by a steel wire spring, the design allowing a wide range of adjustment for brush pressure. A metal cap riveted to the brush avoids wear at the point of contact with the spring lever. A flexible copper connection with ample contact surface is supplied for carrying the current to avoid deterioration of the brush-holder spring.

Connection blocks are bolted to the under side of the magnet frame. To these are fastened the machine leads, which are fitted with suitable terminals for receiving the line cables.

While commutating-pole generators are superior to ordinary generators for any character of service, these machines with their many additional improvements in design will operate in a thoroughly satisfactory and reliable manner under the most severe service conditions where fluctuating motor loads frequently predominate.

A Unique Battery and Switchboard Equipment for Low-Voltage Rural Lighting Plants.

In rural communities, farms and country homes the demand for electric lighting is rapidly increasing. Since many of these places are not accessible to central-station lines there is needed a simple isolated plant for generating the current on the spot. However much each farmer or country citizen may desire the benefits of

Fig. 1.—Battery and Switchboard Ready for Service.

electric lighting and power, the amount he can afford to spend for his plant is usually limited, consequently both the first cost of the apparatus and its cost of installation must be low.

To meet the evident need for a simple equipment and one that could be shipped and installed easily, the Electric Storage Battery Company, of Philadelphia, Pa., has placed on the market the equipment

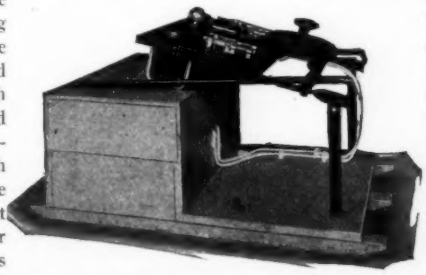


Fig. 2.—Equipment Folded for Shipment.

illustrated in Fig. 1. This consists of a 16-cell Hyray-Exide storage battery and type E switchboard. These are mounted on a single skid platform, with a space between the switchboard and battery box to permit the placing of a generator of appropriate size. This generator is not furnished with the present equipment, but when installed and when the generator is connected to an engine of suitable type for this service the entire electrical plant is complete and ready for operation.

The battery for this equipment consists of 16 cells divided into four sets of four cells in separate trays. These cells are of the thin-plate type used for vehicle service, and therefore make a compact and relatively light-weight battery. The cells are inclosed in rubber jars and all bolt connections are made on top so that it is not necessary to assemble the battery, all the cells being already assembled and connected in the battery box. A ventilated box cover is provided for the battery, which completely incloses and protects it from dirt and dust; while the battery is being charged this cover may be removed.

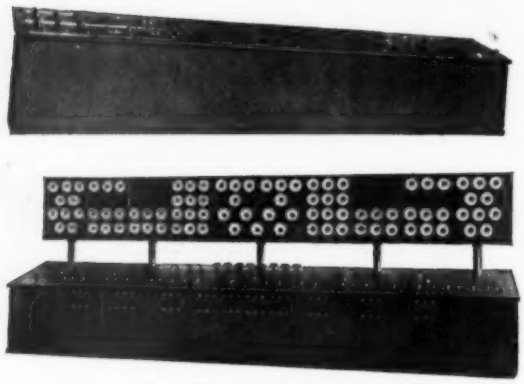
The switchboard is mounted on a supporting frame with hinged legs, permitting the board to be folded down for shipment without disturbing the electrical connections. The board has in the upper left-hand corner an ampere-hour meter, by means of which accurate record of the charge and discharge can readily be kept. Adjoining this in the center is a pilot lamp and at the upper right corner is an ammeter with zero center, so as to be able to read both charging and discharging currents. At the left is a two-pole generator switch and at the right is a similar battery switch; each of these switches is of the fused type. Between the switches is an electromagnetic switch for automatically closing the circuit when the generator voltage rises to the proper value and again opening the battery circuit if a small reverse current should pass during charging from failure of the generator voltage. At the middle beneath the switchboard panel space is reserved for a rheostat, which can be furnished to suit the generator provided in connection with the equipment.

As already suggested above, one of the most unique features of this equipment lies in its being already assembled and connected and also in being readily folded up for shipment. Fig. 2 shows the equipment in the latter condition. All that it is necessary to do then is to crate the outfit, when it is ready to be shipped. The entire outfit is of such compact size that it can readily be placed on an ordinary farmer's wagon and taken to the point of installation with minimum difficulty.

These equipments are furnished in three sizes, the battery in the first having a capacity of 44 ampere-hours; in the second, 78 ampere-hours and in the largest size, 117 ampere-hours. The approximate gross shipping weight of the latter equipment is 775 pounds.

Control Desks of the Sectional Type.

Under conditions where space economy is an important consideration, a control desk may often be used to advantage for the mounting of control apparatus. Standard control desks are sectional in form, each section being a unit in itself corre-



Figs. 1 and 2.—Two Types of Control Desks.

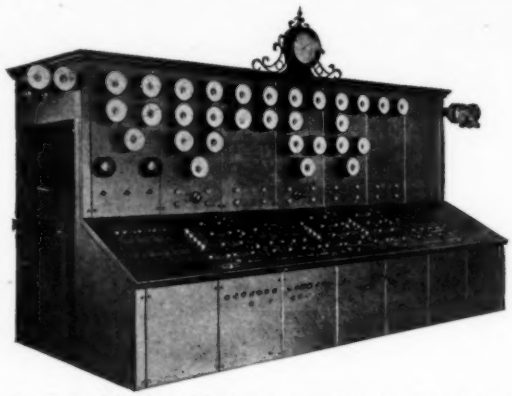


Fig. 3.—Control Desk and Instrument Board with Rear Inclosure.

sponding to the panels of a switchboard.

The desks are built up on a pipe framework having a channel-iron base. The design is such that sections can be easily added to an existing desk by moving one or both end sections and without disturbing apparatus already installed. The top sections are of slate and the sides of steel. Black marine finish is standard for both top and sides to correspond with standard finish of controlling devices and indicators. Access to the desk for wiring is afforded either from the rear or sides by means of cover plates which are easily removable.

These desks can be supplied in three standard types to suit varying conditions. The three types are as follows:

The first type is a plain desk, having no provision for instruments. The desk may be located at any convenient place in the station and still permit an uninterrupted view. Instruments are generally mounted on a supplementary panel switchboard or on instrument posts or frames to suit local conditions. This desk is illustrated in Fig. 1.

The second type of desk includes an instrument frame mounted on posts, as shown in Fig. 2. The frame is supported at such a height as to permit of a view of the station floor. The instrument frame is also of pipe construction with slate panel sections of width to correspond with those of the desk top. The posts supporting the frame are hollow, instrument leads being brought up through them from the desk below.

The third type of desk, illustrated in Fig. 3, has an instrument section extending upwards from the rear edge of desk top, without intervening space. Each section of desk includes the corresponding instrument section. This type of desk is commonly combined with a panel switchboard.

These desks are manufactured by the Westinghouse Electric & Manufacturing Company.

New Universal Electric Grinders and Drills.

The Standard Electric Tool Company, Cincinnati, O., has developed and is now placing on the market a new line of universal portable electric tool-post grinders. These operate on both direct current and alternating current from 0 to 60 cycles, being developed particularly to meet the demand for grinders that will operate equally well on 25, 30 and 40-cycle circuits.

These grinders are provided with ball bearings of the highest grade, which are incased in dustproof chambers packed in grease. This eliminates oiling and prevents flooding with thin oil and damaging the motor windings; it also precludes the possibility of trouble from improper bearing adjustment. These tools are manufactured in one-sixth and one-fourth-horsepower sizes, and they have a speed of approximately 6,000 revolutions per minute, which makes them very effective for internal grinding.

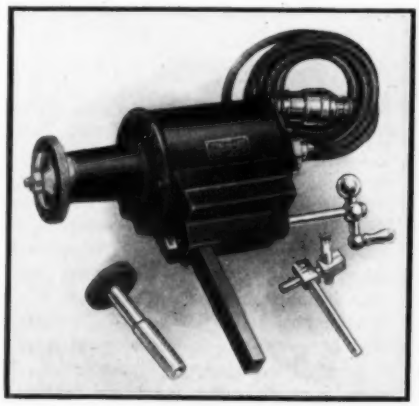
In addition to the above grinders the company is now placing on the market two new sizes of universal drills of five-eighth-inch and one-inch capacity. These are in addition to the seven sizes of universal drills that have been on the market for some time and which were illustrated and described in these columns at an earlier date.

The drills operate on both direct current and alternating current 0 to 60 cycles and, as with the grinders, are especially adapted for 25, 30 and 40-cycle circuits. These drills are ball bearing throughout. The five-eighths-inch size is fitted with a No. 2 Morse taper socket or with a chuck, and the one-inch size with a No. 3 Morse taper socket. All gears are generated from a special grade of steel and are case-hardened and run incased in grease.

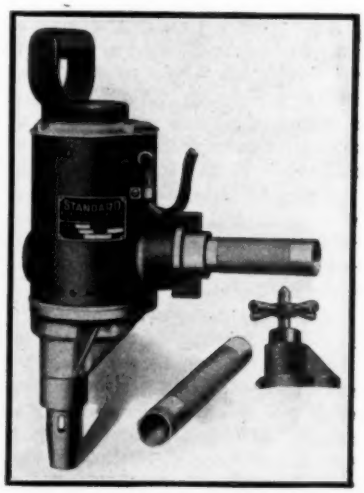
The motors in both grinders and drills are form-wound and are impregnated in Bakelite, which method of winding and insulation prevents grounds, short-circuits and other troubles incident to high-speed apparatus if constructed according to slow-speed motor practice. All tools are air-cooled by means of a high-power fan. These motors develop high power and are capable of severe overload without damage.

The principle of simple, rigid construction has been followed throughout, although weight has been kept down to the minimum. Both drills and grinders are built on the unit plan which makes them very easily dismembered; all electrical connections are made in the frame unit.

The two new sizes of drills have also been added to the line of universal drills for direct current only, as well as that for two and three-phase alternating current.



Universal Electric Grinder.



Universal Electric Drill.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

CAMBRIDGE CITY, IND.—A cluster-light system will be established. Address the city clerk.

NEW IBERIA, LA.—The city will extend the electric-light system. Address the city clerk.

EVELETH, MINN.—A municipal electric light plant will be established here. Address the city clerk.

BUFFALO, IOWA.—The Council is planning to erect a municipal lighting plant. Address the city clerk.

HOMER CITY, PA.—The City is planning to establish a municipal electric light plant. Address S. C. Steel, chairman.

MOOREHEAD, MINN.—The Council is planning to purchase $20,000 worth of electric equipment. Address the city clerk.

HECTOR, MINN.—The Renville County Electric Company has been granted a franchise for electric lights and power.

WILKES-BARRE, PA.—Reilly & Schroeder, architects, have plans for a convent to be equipped with modern electric appliances. N.

DONOVAN, ILL.—The question of establishing a municipal plant is under consideration. Address J. W. Nelson, president of the Board.

GLASGOW, MONT.—The Council proposes to install a new lighting system at an estimated cost of $21,398. E. E. Crawford is city clerk. C.

HIGH POINT, N. C.—The City appointed a committee to investigate purchasing an arc-light system, to cost $25,000. Address F. N. Tate, mayor.

LOUISVILLE, KY.—Two electric elevators will be purchased by the Fiscal Court of Jefferson County for installation in the court house here.

WHITESBURG, KY.—Henry Day, Samuel Collins, Stephen Combs and others have organized a $5,000 stock company to build an electric light plant here.

ALEXANDRIA, LA.—The Alexandria Electric Street Railway Company will construct a power plant at the mill of Bayou Rapids Lumber Company.

HEBRON, O.—This village has voted in favor of a $2,500 bond issue, to provide funds for wiring for commercial and municipal electric lighting and power service. J.

BROWERVILLE, MINN.—The Browerville Electric Light & Power Company was incorporated by H. E. Hart, Thomas Heid, and others with a capital stock of $10,000.

WARSAW, N. C.—The Duplin Power Company will build an electric light plant to develop 125 horsepower. Address C. W. Petty, engineer, 848 North Street, Greensboro.

DANVILLE, KY.—A new hotel will be built to replace the Gilcher Hotel, recently destroyed by fire, by Malcolm Weisiger, and electric elevators will be required. G.

CLINTON, IND.—Superintendent C. M. Poor, of the Clinton Electric Light & Power Company, will purchase a 500-kilowatt generator set for the use of the company. G.

KANSAS CITY, KANS.—The Kansas City, Kaw Valley & Western Electric Railway will spend $25,000 for the installation of transformers at the municipal power plant here. M.

PHILADELPHIA, PA.—Messrs. George & Borst are taking estimates for the erection of a new electric power plant for the Counties Gas & Electric Company at Norristown, Pa. A.

WOONSOCKET, S. D.—Plans are being made for establishing a central station here and furnishing light and power to Wessington Springs, Alpena, Lane, Forestburg and Artesian. C.

HOLT, MO.—The Town Board has a proposition before it from the Kansas City promoters, looking to the establishment of an electric-lighting system for the town. Address the county clerk.

ALLENTOWN, PA.—There will be quite an electrical contract involved in the completing of the new court house to be erected here. R. S. Rathburn, Hunsicker Building, is the architect.

CHICKAMAUGA, GA.—The Council has granted a franchise to a company for lighting the town with electricity. The plant, it is said, will be installed within the next six months. Address the mayor.

FT. WAYNE, IND.—Improvements to the extent of $75,000 will be made in the municipal electric plant, including the installation of a new generator and the construction of 40 miles of new lines. G.

BEAUMONT, TEX.—The Stone & Webster Engineering Corporation will expend $100,000 in improvements, including the local power plant. Local officials have been authorized to make the expenditure.

NASHVILLE, TENN.—The Nashville Traction Company will erect a plant to generate power for operating the traction system and for commercial purposes. Address W. E. Steger, counsel, for further particulars.

DREWSEY, ORE.—John E. Johnson & Sons have filed on a power site above the Ott sawmill, with a view of constructing a power plant and transmitting electric current to a number of near-by towns.

LOUISVILLE, KY.—This city will grant a franchise for an electric-light plant for street and domestic lighting. Bids will be received May 1. Address J. A. Hagan, mayor, 3830 Grand Boulevard, Louisville.

JERSEY CITY, N. J.—The Paulinskill Water Power Company has been incorporated with a capital of $100,000 to operate water-power plants. C. M. Pihl, A. D. Lord and A. B. Cheadle are the incorporators. A.

HALLS, TENN.—This town will issue bonds to the amount of $5,000, the greater part of the proceeds of which will be used for an electric light plant for the town. B. M. Archer is in charge of the matter. G.

NEWARK, O.—The Ohio Light & Power Company is securing right of way for a high-tension line between this city and Shawnee. The company operates large plants both at Newark and at Parkersburg, W. Va. J.

EVANSVILLE, IND.—The Evansville Public Service Company will furnish current to Ft. Branch, Ind., through a substation, and the plant of the Electric Light Company of the latter place will be dismantled. G.

PRINCESS ANNE, MD.—The city will install a street-lighting system. Specifications require 65 to 80 candlepower lamps to burn all night. Bids will be received on April 3. Address J. Douglass Wallop, commissioner.

JERSEY CITY, N. J.—Paulinskill Water Power Company has been incorporated to operate water-power plants. The capital stock is $100,000 and the incorporators are C. M. P. Pihl, A. D. Lord and A. B. Cheadle.

INDIANAPOLIS, IND.—A 12-story hotel and coliseum to seat 7,000 people will be built here by Robert S. Fletcher, and it is probable that an electric plant will be built in connection. Electric elevators will be used.

BUTLER, GA.—J. M. Harrison, Montezuma, Ga., is planning to utilize the water power at McCants Mill for furnishing current for electric lights in Butler. A stock company is being organized to undertake the development.

SAN FRANCISCO, CAL.—Business men and property owners along Mission Street have agreed to pay $15,000 for the installation of ornamental arches for the better lighting of that street between Sixteenth and Twenty-fourth Streets.

CLIFTON FORGE, VA.—The Virginia Western Electric Company will construct about 30 miles of 44,000-volt transmission line and several substations, and will purchase six 44,000-volt transformers from 15 kilowatts to 200 kilowatts.

GREENVILLE, S. C.—The Buncombe Road Electric Light Company has been incorporated with a capital stock of $500 to construct and operate an electric-light line. The incorporators are R. K. Taylor, R. A. League and others.

TYLERTOWN, MISS.—T. C. Simmons and W. A. Boyd, business men, have purchased the Tylertown Light & Power Company's plant, formerly operated by C. H. Stevens. The new proprietors expect to materially enlarge and improve the plant.

TOPEKA, KANS.—The Elmhurst Investment Company is contemplating the construction of an electric power plant at Garden City and a power line down the river through Charleston, Ingalls and Cimarron. N. B. Burge is president of the Company. M.

ROCKFORD, ILL.—The Rockford Electric Company is planning to double its extension work for 1914. In previous years the extension work has been about ten miles of wire, while this year it will exceed 20 miles. Address Adam Gschwindt, manager.

OKOLONA, MISS.—The Mississippi Electric Company has been organized with a capital stock of $5,000,000 and plans the construction of an electric line from Okolona to Aliceville, a distance of 70 miles. Address A. L. Jagoe, of Okolona, for information.

LAWRENCEBURG, IND.—The J. R. Stevens Company, of Cincinnati, O., will build a concrete-and-brick distillery and grain elevator here for the W. P. Squibb Distilling Company. Light and power will be furnished by electricity, and considerable equipment will be required. G.

INDIANAPOLIS, IND.—The Board of Park Commissioners has under consideration the substitution of an electric-lighting system for the gas and gasoline lighting system now used in the city parks, and the proposed new system may also be extended to the boulevards. Address B. J. T. Jeup, city engineer.

PARKVILLE, MICH.—Although this little St. Joseph County hamlet is located away from any railway and miles from any city, the residents have decided to put in a complete lighting system. The place is not incorporated and therefore cannot bond, so the money to build the lighting plant has been raised by popular subscription.

NORTH PLATTE, NEB.—The North Platte Gas & Electric Company has been reorganized under the name of the North Platte Electric Company, and will be operated by the Union Company, of Omaha, Neb. The plant will be rebuilt and new equipment will be installed. Address Willis Todd, engineer, for further information.

EDMONTON, ALTA.—Representatives of Smith, Kerry and Chase, Toronto, Ont., recently investigated a water-power site on the Athabasca River at Grand Rapids, and from good authority comes the information that a $5,000,000 power plant will be erected at this point. For further information, address the company named at Toronto. O.

KELSO, WASH.—F. M. Housh, construction engineer in the employ of the Washington-Oregon Corporation, recently announced that work of constructing a new power line, costing about $15,000, between Winlock and Toledo, a distance of seven miles, will begin in the immediate future, and will be rushed to completion as rapidly as possible. O.

BOONE, N. C.—The Appaladrian Training School, of Boone, N. C., is having prepared plans and specifications for a 200-horsepower hydroelectric development on New River. D. R. Shearer, consulting engineer, Knoxville, Tenn., is in charge of the design and will receive bids for the construction work as soon as the plans are completed.

LONDON, O.—The expert employed to go over the lighting system of the city estimates that it will require from $10,000 to $15,000 to put the local power plant in good condition. He recommends that the city make this outlay, instead of purchasing power from the Ohio Electric Railway Company, as has been advocated by part of the Council. J.

LEXINGTON, KY.—The Kentucky Utilities Company, which controls the Kentucky Public Service Company, of Frankfort, Ky., is planning to furnish current to the latter town from its Lexington plant, and will dismantle the Frankfort plant, at least partially. The Lexington plant may be enlarged for this purpose, and will also require transmission equipment for the proposed line. G.

JOLIET, ILL.—Bids will be received by the Board of Prison Industries of the State of Illinois, Springfield, Ill., on April 6, for furnishing additional equipment for stone-crusher plant, such equipment to include electric motors of sufficient power to drive same at full capacity, also switch engine and steam shovel fully equipped. Address Board of Prison Industries, Ralph R. Tilton, secretary, Danville, Ill.

ALBANY, ORE.—A municipal electric light and power plant project for this city has been launched with the Commercial Club, and a committee has been appointed to investigate the feasibility of such a proposition, with instructions to report back to the Club at an early date. The proposed plan is to have the city construct, equip and maintain a municipal light, power and water system. For information address A. H. Hammer, Commercial Club. O.

LEXINGTON, KY.—The Kentucky Utilities Company, whose general offices are here and which operates a plant at Hopkinsville, Ky., as well as in other Kentucky towns, has purchased for $114 a franchise giving it the right to construct and operate electric light and power lines in Christian County. It is understood that the franchise was sold for the purpose of enabling the company to construct a transmission line to Pembroke, a nearby town, to which it will furnish current. G.

CHELAN, WASH.—The City Council of this city and Lakeside, near here, have decided to co-operate in the installation of a municipal light and water plant to serve both cities. F. C. Humphery, of Spokane, representing the Fairbanks-Morse Company, has made a proposition to the Councils, offering to install the systems, but this offer has not been accepted to date. In all likelihood, competitve bids covering the system will be asked for. For information, address Mayor Emerson, of Chelan, or Councilman H. E. Ward, of Lakeside. O.

PORTLAND, ORE.—Acting Secretary of Agriculture B. T. Galloway recently issued a permit to James Lindsay, of this city, for the construction and operation of a power plant on Mill Creek, Douglas County. The promoter intends to transmit the power obtained from this hydroelectric plant to this city, a distance of 18 miles. Three 1,150-horse power horizontal Francis type turbines, acting under a head of 263 feet, will be direct-connected to three 750-kilowatt three-phase, alternating-current generators. The current is to be transmitted at 22,000 volts from the plant to the town. The power house is to be constructed with a concrete foundation.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

RAVENNA, NEB.—The Ravenna Telephone Company plans to rebuild all its lines.

BANGOR, WIS.—Bangor Telephone Company has been incorporated with a capital of $25,000.

LOS ANGELES, CAL.—$250,000 will be expended for a new fire alarm. Address the city electrician.

MT. CARMEL, ILL.—The Mt. Carmel Telephone Company will establish a new system at Mt. Carmel. Address H. J. Leach, manager.

PINE ISLAND, MINN.—The Pine Island Telephone Company has been incorporated by John Clemens, James P. Kane and others.

QUITMAN, GA.—Concord Telephone Company has been incorporated with a capital stock of $175 by J. B. Shiver, and others.

WISEMAN, KY.—The Licking River Telephone Company has been incorporated with a capital stock of $645 by Jasper Holbrook and others.

MINOT, N. D.—The South Prairie Farmers Telephone Company has been incorporated with a capital stock of $10,000 by C. M. Christiansen and others.

BALDWIN, ILL.—The Baldwin Telephone Company, has been incorporated with a capital stock of $2,000 by Henry Lucht, W. R. Preston and others.

DELL RAPIDS, S. D.—The Highland Rural Telephone Company has been incorporated with a capital stock of $2,000 by Peter A. Anderson, G. T. Bras and others.

LOS ANGELES, CAL.—Arrangements have been made by the Pacific Telephone & Telegraph Company for the expenditure of $16,700 for immediate improvements to the local telephone system. T.

EAST CHATHAM, N. Y.—New Concord Telephone Company, Incorporated, has been granted articles of incorporation, with a capital stock of $500. The incorporators are Edward J. Colbert, J. Edwin Brown and John C. Daley, all of East Chatham.

KELLEYS ISLAND, O.—With the proceeds of the sale of an additional $6,700 of capital stock, the Kelley's Island & Sandusky Cable Company, will string a new cable between Kelley's Island and Marblehead. The company is desirous of handling telegraphic and telephone communication at the same time.

SWEENY, TEX.—The Sweeny Co-operative Telephone Company has been organized at this place. The following officers were elected to serve for the ensuing year, L. A. Riley, president; L. Schadler, vice-president; L. W. Engsberg, secretary; Dr. M. H. Eades, W. H. Clark, John Bagley, directors; H. Draper, business manager. Work on actual construction will begin at an early date and pushed to completion.

WATERVILLE, WASH.—D. M. Russell, of Appledale, and associates, recently incorporated the Moses-Coulee Telephone Company, and have announced their intention of constructing a line from the Columbia River to the large orchards in the Coulee Valley. The company has asked the Farmers Independent Telephone Company here to extend its line from Alstown to Palisades, thus connecting the line with the county seat. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

BLAINE, WASH. — The Blaine Lynden Electric Railway Company has been incorporated with a capital of $250,000 by John Pinckney, Lester Livingstone, and J. A. Willison.

FENTON, MICH.—Harry Hoever has begun a campaign for an electric line between Fenton and Howell to be owned by Ludington County. Mr. Hoever says the line can be built for $20,000 per mile or $120,000 for the entire distance.

ADRIAN, MICH.—Persistent rumors are current here to the effect that an extension of the Toledo & Western electric railway will be made soon from Adrian to Jackson, by way of Rome Center, Manitoy Beach, Wild Water Beach, Devil's Lake Station, Addison and thence on to Jackson. Address C. W. Laskey, 607 Nashby Building., Toledo, O., for further information.

SAN FRANCISCO, CAL.—A new electric company, to be known as the San Francisco & Northern Railway Company, is being formed here, to reorganize the Petaluma & Santa Rosa Railroad Company and to provide direct service between San Francisco and Healdsburg. Its steamship connection with this city will be by way of Petaluma. Expenditures of $10,000,000 will be involved.

NEW YORK, N. Y.—Westinghouse, Church, Kerr & Company, of Montreal and New York, have been retained by the Canadian Pacific Railway as engineers to investigate the matter of the proposed electrification of the new double-track Selkirk Tunnel in British Columbia. The investigations will cover in general the type of system to be installed, the relative economies of steam and water power and the effect of the electrification upon operating conditions.

OLATHE, KANS.—The Olathe, Winfield & Arkansas City Railway Company has been incorporated with a capitalization of $1,000,000 to construct an electric road 175 miles in length between Olathe, Kans., and Arkansas City, Ark. The incorporators are J. W. Gettel, W. A. Powell and F. A. Nickel, of Enid, Okla.; P. E. Wiles, Lamont, Okla.; J. E. Jones, Atlanta, Kans.; P. H. Guy, P. H. Albright, W. H. Perry, and C. M. Wallace, of Winfield, Kans. M.

ARDMORE, OKLA.—The Ardmore Electric Railway Company has been chartered to construct seven miles of street car lines in Ardmore. The estimated cost of the lines is $150,000 and the capital stock of the company is $110,000. The incorporators are George S. Craven, James C. Mort and John F. Easley, Ardmore; Asa B. Hale and William Craven, Milton, Iowa. All preliminary arrangements have been made and it is understood that construction work will start soon. P.

EVANSVILLE, IND.—It has been announced here that the suits against the Evansville, Chrisney & Lynnville Traction Company to prevent the collection of subsidy taxes in certain townships in Warrick County will be dismissed at once, and work on the building of the two lines will be started and pushed to completion. Bonds will be issued. The company will build a traction line from Boonville to Chrisney and another from Boonville to Lynnville. Both lines have been surveyed. It is believed that construction work on both roads can be finished by the first of next year.

FOREIGN TRADE OPPORTUNITIES.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Custom-house, New York, N. Y., 629 Federal Building, Chicago, Ill., Association of Commerce Building, New Orleans, La., and 76-78 Appraisers' Stores Building, San Francisco, Cal. Apply for addresses in letter form, giving file numbers.]

NO. 12,561. TRAIN LIGHTING SYSTEMS.—On a railway line between two foreign cities two trains are now running, fitted with experimental electric generators and accumulators for lighting purposes. The tests have been going on for some time, and it is not yet known whether either will be adopted or other systems will be invited to make experiments. An American consular officer furnishes the name of the railway in question and states that correspondence in regard to other systems of lighting should be addressed in Spanish.

NO. 12,718. ELECTRIC STOVES AND APPLIANCES.—An American consul reports that the residents of his district are beginning to equip their kitchens with electric cooking stoves, as two companies are supplying current at rates that easily compete with fuel. Manufacturers of electric stoves and allied appliances should furnish the consul with catalogs in English or Spanish. Price lists giving all discounts should accompany the catalogs.

NO. 12,719. WIRELESS TELEGRAPH STATIONS.—The American consul at Madrid reports that bids are requested for supplying and installing two wireless telegraph stations in Spain. Bids must be submitted through a local agent.

NEW INCORPORATIONS.

AUSTWELL, TEX.—The Austwell Utilities Company has been incorporated with a capital stock of $25,000 by P. R. Austin, D. S. Emison and W. H. Dunson.

McCALLEN, TEX.—The McAllen Ice, Light & Water Company has been incorporated with a capital of $10,000 by F. E. Osborne, R. E. Hoen, and J. T. Cardwell.

NEW YORK, N. Y.—South Electric Manufacturing Company, Incorporated, has been incorporated, capitalized at $25,000, by Lewis C. Randolph, William D. Ligon and Charles R. Peddle, all of New York City.

EAST ST. LOUIS, ILL.—American Carbon & Battery Company has been incorporated with a capital stock of $250,000 to manufacture and deal in carbon products. The incorporators are William C. Schramm, Joseph O'Neil and Frank H. Sullivan.

NEW YORK, N. Y.—Progressive Electric Welding Company, Incorporated, has been granted articles of incorporation, capitalized at $30,000, by Ernst Von Der Heyde, Eugene Wollesky, of New York City, and Charles L. White, of Passaic, N. J.

CLEVELAND, O.—Electric Products Company has been incorporated for the purpose of manufacturing and dealing in electrical supplies. The capital stock is $1,000 and the incorporators are William Rodewell, Joseph F. Meyer, George B. Myers, V. C. Birchall and T. H. Ball.

WILMINGTON, DEL.—A Delaware charter has been secured by the Polyacousticon Company. Incorporated. The promoters propose to erect wireless stations along the Atlantic Coast and to maintain, besides, the usual message service, a system of aerogram press service. Charles B. Bishop of Wilmington, Del., is the officer of record. Eastern capitalists are said to be backing the venture. N.

PROPOSALS.

ELECTRIC-LIGHT CABLE. — On March 26 bids will be received by F. T. Bowler, secretary, Detroit, Mich., for furnishing lead-covered electric-light cable and oil-break switches.

WHITE WAY LIGHTING SYSTEM.—Bids will be received March 31 for furnishing all material for the construction of a "White Way" lighting system. Address A. R. Watkins, city auditor, Fargo, N. D.

ELECTRICAL EQUIPMENT. — Bids will be received on April 6th for 25 electric meters; 1,000 electric lamps; 500 pounds of insulated wire; 500 pounds of copper wire; 100 cross-arms; 400 pins. Address H. S. Ely, city clerk, Winterset, Iowa.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 7 for furnishing 275 cross-arms for electric-light poles and three single-phase transformers, as per Schedule 6537, for delivery at the Navy Yard, Norfolk, Va.

EXTENSION TO POWER HOUSE.—April 15 bids will be received for labor and material necessary for the construction of an addition to the power house, extension of steam, water and electric lines, additional machinery, telephone system, signal system, etc., in accordance with plans and specifications prepared by Architects C. C. & A. L. Thayer, of Newcastle, Pa. Work to be done at the District Tuberculosis Hospital, Springfield Lake. Address F. L. Allen, secretary.

ELECTRICAL EQUIPMENT. — Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 21 for supplying the following electrical equipment to be delivered to the Navy Yard named in each case, all as per Schedule 6434; one six-drop watertight annunciator, miscellaneous electric fixtures, six portable voltmeters, 100 portable hooks, Brooklyn, N. Y.; miscellaneous nonwatertight bells and buzzers, Brooklyn and Philadelphia; miscellaneous branch boxes, junction boxes, etc., Norfolk and Mare Island; four 250-volt 25-ampere circuit breakers, 175 pounds hard sheet rubber, Mare Island; 1,975 portable nonwatertight guards, 31 120-volt electric flat irons, East; 12 120-volt electric disk heaters, Philadelphia and Mare Island; miscellaneous shadeholders, Brooklyn and Norfolk; 120 keyless sockets, catalog 59,954, Puget Sound; 45,000 two-hole wire terminals, Boston and Norfolk; miscellaneous terminal and stuffing tubes, Norfolk; 300 nonwatertight push buttons, Brooklyn and Mare Island; miscellaneous sheet and rod fiber, interior fittings, interior fittings for switches, 85,000 three-ampere glass-tube fuses, miscellaneous cartridge-type inclosed fuses, link and plug fuses, renewable fuses and elements for same, 3,200 hard-rubber bushings, miscellaneous pear-shaped push buttons, miscellaneous insulators, electric soldering irons, mica and pressed mica plate, nonwatertight attachment plugs, 20 portable ventilating sets and miscellaneous wire magnet, for Navy Yards East and West.

FINANCIAL NOTES.

Chicago City Railway will issue $3,000,000 first-mortgage rehabilitation bonds for 1914 needs.

The Pacific Gas & Electric Company, it is stated, will shortly issue $12,000,00 six-per-cent preferred stock, ranking with the present issue of preferred. The new securities, it is said, will be offered to preferred stockholders at 80, on a basis of six shares of new stock for five shares of old.

Stockholders of the Cities Service Company, at the next annual meeting of the company, to be held at Dover, Del., April 7, will be asked to approve an increase in the capitalization of the company from $20,000,000 common and $30,000,000 six-per-cent preferred to $25,000,000 common and $40,000,000 six-per-cent preferred, respectively. The new stock will not be issued promptly, but is to allow the company the right to do future financing.

Sales of the Idaho-Oregon Light & Power Company, which was to be made on March 16 under order of the court in the receivership proceedings, was deferred, and no date set for future sale. The property will continue to be operated by the receiver, and the court will be asked to authorize the issue of receiver's certificates for approximately $250,000, the proceeds of which will be used to install about 4,000 horsepower at the Ox Bow hydroelectric development. The company will then be able to provide all its own current, and purchases from other companies may be discontinued.

The Board of Directors of the North American Company at its organization meeting elected James Campbell chairman. Mr. Campbell had resigned as president. James D. Mortimer, vice-president, was elected to succeed him, and George R. Sheldon was elected vice-president to succeed Mr. Mortimer. James F. Fogarty, Edwin Gruhl and William T. Graham have been elected directors during the last year to fill the vacancies. Retiring officers were re-elected at the annual meetings of the West Kentucky Coal Company, Milwaukee Railway and Electric Light Company, Milwaukee Light, Heat and Traction Company and the Wisconsin Edison Company.

Under the reorganization plan, the American Water Works & Guarantee Company will be known as the American Water Works & Electric Company. Each depositor of preferred stock will be entitled, upon subscription and payment of $35 a share, to receive $40 par value in first preferred and $100 par value in participating preferred stock of the new company. Each depositor of preferred stock, who does not make any subscription and payment, will be entitled to receive for each share of preferred $50 par value in participating preferred stock on payment of an assessment of $5 each on the shares of the old company.

Dividends.

American Public Utilities; quarterly, of 1.5 per cent on preferred, payable April 1 to stock of record March 16, and 0.75 per cent on common, payable April 2 to stock of record March 16.

American Telephone & Telegraph Company; quarterly of two per cent, payable April 15 to stock of record March 20.

California Electric Generating Company; a quarterly preferred dividend of 1.5 per cent, payable April 1 to stock of record March 20.

California Railway & Power Company; a quarterly preferred dividend of 1.75 per cent, payable April 1 to stock of record March 21.

Capital Traction Company; a quarterly dividend of 1.5 per cent, payable April 1 to stock of record March 14.

Cincinnati Suburban Bell Telephone Company; quarterly of 2.5 per cent, payable April 1.

Cincinnati, Hamilton & Dayton Traction Company; a quarterly common dividend of one per cent, and a preferred dividend of 1.25 per cent, both payable April 1 to stock of record March 20.

Cities Service Company; monthly of 0.5 per cent on preferred and 0.5 per cent on common, both payable May 1 to stock of record April 15.

Columbus, Newark & Zanesville Electric Railway Company; a quarterly preferred dividend of 1.5 per cent, payable April 1 to stock of record March 25.

Detroit Edison Company; quarterly of 1.75 per cent, payable April 15 to stock of record April 1.

Eastern Michigan Edison Company; quarterly of one per cent, payable April 15 to stock of record April 1.

Electric Securities Corporation; a quarterly common dividend of two per cent, and a quarterly preferred dividend of 1.25 per cent; the former payable April 1 and the latter May 1.

Houghton County Traction Company; semi-annual of $2.50 on common and $3 on preferred, both payable April 1 to stock of record March 21.

Kansas Gas & Electric Company; quarterly of 1.75 per cent on preferred, payable April 1 to stock of record March 25.

Lowell Electric Light Corporation; quarterly of $2 a share, payable May 1 to stock of record April 15.

Massachusetts Lighting Company; quarterly of $1.75 a share on old common, $1.50 a share on new preferred, and 25 cents a share on new common, payable April 15 to stock of record March 25.

National Carbon Company; quarterly of 1.5 per cent on common, payable April 15 to stock of record April 4.

New England Telephone & Telegraph Company; quarterly of 1.75 per cent, payable March 31 to stock of record March 18.

New Orleans Railway & Light Company; quarterly of 0.5 per cent on common and 1.25 per cent on preferred, payable March 31.

Niagara Falls Power Company; a quarterly dividend of $2 per share, payable April 15 to stock of record March 31.

Philadelphia Company; quarterly of 1.75 per cent on common and semi-annual of three per cent on preferred, both payable May 1 to stock of record April 1.

Public Service Corporation of New Jersey; a quarterly dividend of 1.5 per cent, payable March 31 to stock of record March 27.

Republic Railway & Light Company; quarterly of 1.5 per cent on preferred, payable April 15 to stock of record March 31.

Trinidad Electric Company; quarterly of 1.25 per cent, payable April 10 to stock of record March 31.

United Utilities Company; quarterly of 1.75 per cent on preferred, payable April 1 to stock of record March 21.

Winnipeg Electric Railway Company; quarterly of three per cent, payable April 1 to stock of record March 20.

Reports of Earnings.

UTAH SECURITIES CORPORATION.

(Utah Power & Light and Subsidiaries.)

	1914	1913
January gross	$ 158,400	$ 140,575
Net after taxes	95,306	80,201
Six months' gross	936,145	754,076
Net after taxes	560,069	412,785
12 months' gross	1,773,286	1,485,989
Net after taxes	1,062,869	806,609

CENTRAL STATES ELECTRIC.

The Cleveland Electric Illuminating Company operating subsidiary of Central States Electric Corporation reports:

	1914.	1913.
January gross	$ 409,468	$ 361,975
Net after taxes	209,909	186,211
Surplus after charges and preferred dividends	174,305	149,856
Twelve months' gross.	4,056,268	3,261,457
Net after taxes	1,958,308	1,506,155
Surplus after charges and preferred dividends	1,546,227	1,121,575

NORTHERN STATES POWER.

The consolidated earnings of the companies embraced in the Northern States Power Company and the Consumers Power Company, for the twelve months ended December 31, 1913, compare as follows:

	1913	1912
Gross	$3,887,408	$2,821,402
Net	1,956,934	1,374,743
Surplus after charges	752,309	531,130
Preferred dividend	571,513	423,163
Surplus	180,796	107,967

CONSUMERS' POWER COMPANY.

The Consumers' Power Company of Maine and its constituent companies report for January and 12 months as follows:

	January	12 Months
Gross earnings	$318,067	$3,174,732
Operating expenses	119,939	1,440,043
Net earnings	$198,127	$1,734,688
Fixed charges	92,639	1,021,456
Net profits	$105,488	$713,232
Div. preferred stock	27,500	323,500
Balance	$77,988	$389,732

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	March 23	March 16
American Tel. & Tel. (New York)	122	122⅜
Commonwealth Edison (Chicago)	139	138
Edison Electric Illuminating (Boston)	260	260½
Electric Storage Battery common (Philadelphia)	54¼	53½
Electric Storage Battery preferred (Philadelphia)	54¼	53½
General Electric (New York)	147½	147½
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1⅛
Massachusetts Electric common (Boston)	11	11½
Massachusetts Electric preferred (Boston)	61½	62
National Carbon common (Chicago)	109	105½
National Carbon preferred (Chicago)	117	117
New England Telephone (Boston)	138	138
Philadelphia Electric (Philadelphia)	26¾	26⅞
Postal Telegraph and Cables common (New York)	83½	84½
Postal Telegraph and Cables preferred (New York)	64¾	64¾
Western Union (New York)	63¼	63½
Westinghouse common (New York)	77¼	75¼
Westinghouse preferred (New York)	118	116¾

PERSONAL MENTION.

MR. MILES F. STEEL, Pacific Coast representative of the Benjamin Electric & Manufacturing Company, was in Salt Lake City last week on his regular trip over the territory.

MR. VICTOR L. CRAWFORD, who for nine years has been in continuous service with the firm of W. N. Matthews & Brother, St. Louis, Mo., has tendered his resignation, effective April 1.

MR. W. H. TRASK, formerly commercial agent of the Idaho Railway, Light & Power Company, has taken a position in the commercial department of the Utah Power & Light Company at Salt Lake City.

MR. C. B. HAWLEY, manager of the Intermountain Electric Company, Salt Lake City, has returned from Pocatello, Idaho, where he spent a week in connection with his company's business in that territory.

MR. A. L. POWELL, of the Edison Lamp Company, Newark, N. J., tendered an address on the illumination of streets, homes, public buildings and factories, before the Clinton Hill Improvement Association, Berkeley Hall, Newark, on March 9.

MR. PRESS H. BAILEY, formerly of Fremont, O., where he was manager of the Fremont Gas, Electric Light & Power Company, has been doing excellent work in his new location at Louisville, Ky., where he is industrial engineer of the Louisville Gas & Electric Company.

MR. J. C. RENNARD, real-estate manager of the New York Telephone Company, delivered an address entitled "The Real Estate of a Telephone Company" at the 151st meeting of the Telephone Society of New York, held at the United Engineers' Building, New York City, on March 23.

MR. CHARLES S. GLEED, chairman of the Board of Directors of the Southwestern Telephone System, spoke on the subject of "Public Service Corporations" at the luncheon meeting of the St. Louis League of Electrical Interests, Jovian Chapter, held at the American Hotel Annex, St. Louis, Mo., on March 24.

PROF. WARWICK ANDERSON, who occupies the chair of physics in the University of Louisville, Louisville, Ky., addressed a recent meeting of the Engineers' and Architects' Club of that city on the subject "A Recent Electric Theory." The theory referred to was to the effect that electric forces are the basis of all matter.

MR. J. GLEASON, traveling representative for the Western Conduit Company, subsidiary to the Youngstown Sheet Tube Company, Youngstown, O., has been appointed manager of the Philadelphia (Pa.) office of the same company, with offices at 1733 Land Title Building. Mr. Gleason assumes his new duties immediately.

MR. WILLIAM P. BEAR, formerly with the Westinghouse Electric & Manufacturing Company and with the General Electric Company, has been appointed traveling representative of The Trumbull Electric Manufacturing Company, Chicago, Ill., with headquarters in that city. Mr. Bear will cover the states in that territory east of the Mississippi River, also Iowa, Missouri, Arkansas and the Southern states south of the Virginia line, relieving MR. W. P. NASER, who will now devote his attention to the Northern and Western territory, also with headquarters in Chicago.

MR. O. G. DRAPER has resigned as business secretary of the Electric Motor Car Club of Boston, Mass., and the New England Section, Electric Vehicle Association of America, and has become identified with the Buffalo Electric Vehicle Company, Buffalo, N.. Y., devoting his activities to the New England field. MR. CHARLES H. MILES, in charge of electric vehicle work for the Edison Electric Illuminating Company, of Boston, will carry on the duties connected with the above organization.

MR. R. J. McCLELLAND, chief engineer of the Electric Bond & Share Company, of New York City, accompanied by MR. LOUIS ELLIOTT, New York engineer for the same company, for the Utah, Idaho and Colorado district; MR. H. H. DEWEY, engineer for the General Electric Company in the power and mining department, handling matters in the same territory; and MR. F. C. GREEN, engineer of the transformer department at the Pittsfield Works of the General Electric Company, have been in Salt Lake City during the past week going over the system of the Utah Power & Light Company, particularly with reference to the 110,000-volt transmission system which that company proposes to place in operation in the near future.

OBITUARY.

MR. EDWIN N. CORYELL, consulting engineer of New York City, died of heart failure in his office on March 23. He had been for 30 years consulting engineer for the Cameron Steam Pump Works, owned by the Ingersoll-Rand Company.

MR. WALTER L. ISAACS, an electrical expert, died of pneumonia at his home in Brooklyn, N. Y., on March 8 at the age of 50. He was formerly in business on the Isthmus of Panama and was a Past Master of a Masonic lodge of the city of Panama. He leaves a wife, four sons and three daughters.

MR. BYRON LAFLIN SMITH died in Chicago, Ill., on March 21, of heart failure. Mr. Smith was president and founder of the Northern Trust Company, of Chicago, a director of the Chicago & Northwestern Railroad Company, the Atchison, Topeka & Santa Fe Railroad Company, and of the Commonwealth Edison Company.

MR. CHARLES E. Du VAL, head of the accounting department of the Edison Electric Illuminating Company, died of general debility at his home in Brooklyn, N. Y., on March 9. Mr. Du Val was 60 years of age and had been connected with the Edison company for more than 30 years, and was at one time associated with Mr. Thomas A. Edison. He was a member of the Veterans' Association of the Twenty-third Regiment. He is survived by two sons and two daughters.

MR. JAMES SHELDON CUMMINS, one of the original partners of H. M. Byllesby & Company, died at his residence, the Bryson Hotel, Chicago, Ill., on March 23, after an illness of two weeks. Mr. Cummins was born in 1857 in Pennsylvania, the son of James R. and Sarah Bishop Cummins, and was educated at Swarthmore College. He was admitted to the Pennsylvania bar in 1882 and practiced law at Media, Pa., where he was married in 1889 to Alice Charlotte Byllesby, daughter of the Rev. DeWitt Clinton Byllesby. In 1891 Mr. Cummins came to Chicago and was counsel for the Thomson-Houston Electric Company until the company was consolidated with the General Electric Company in 1893, after which date he served the latter company in a similar capacity. The deceased was the senior member of the law firm of Cummins, Stearns & Milkewitch, and vice-president, director, senior counsel and one of the founders of H. M. Byllesby & Company, whose offices were closed on March 25 as a mark of respect.

NEW PUBLICATIONS.

VALUATION FOR RATE-MAKING.—The article by Robert H. Whitten entitled "Fair Value for Rate Purposes" has been reprinted from the *Harvard Law Review*, Vol. XXVII, No. 5.

GOVERNMENT OWNERSHIP.—The report of the committee of the Post Office Department on "Government Ownership of Electrical Means of Communication" has been printed as Senate Document No. 399, and is now available for distribution.

CANADIAN ELECTRICAL RULES.—The Hydro-Electric Power Commission of Ontario has issued a second edition of the "Rules and Regulations for Interior Electrical Work, Signaling Systems, Wireless Telegraph Apparatus, Electric Railway Work," etc.

DATES AHEAD.

Society of Efficiency, New York, N. Y., April 4-11. Secretary, W. H. Tallis, 41 Park Row, New York City.

American Institute of Electrical Engineers. Pittsburgh, Pa. April 9-10. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

American Physical Society and American Institute of Electrical Engineers. Joint meeting, Washington, D. C., April 24-25.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Federal Sign System (Electric), will remove its New York office to the United States Rubber Building, 1790 Broadway, New York City, on March 30.

The Delta-Star Electric Company, Chicago, Ill., is distributing bulletin No. 3, devoted to high-tension line and outdoor substation equipments. About 105 illustrations are shown, many of which are of installations in operation.

The Connecticut Telephone & Electric Company, Meriden, Conn., manufacturer of the well known Connecticut ignition products, has appointed Chas. E. Stahl, of Chicago, sales manager.

The Bristol Company, Waterbury, Conn., has issued bulletin No. 801 devoted to the Bristo patented safety setscrews. This bulletin points out the advantages of this type of hollow setscrew, describes their construction and gives full data respecting them.

Cooper Hewitt Electric Company announces that the steady increase in its business has necessitated the removal of its Chicago office to 506 Fisher Building. The new quarters provide more room for this office and in every way afford better facilities for the prompt conduct of the business.

The Import Sales Company, New York City, announces that the Diamond line of flashlights is increasing in popularity. Full information, including special circulars, catalogs and leaflets are available for distribution. The company has moved into new quarters and has now available more than twice the floor space that was used last year.

The Holt Electric Company, Milwaukee, Wis., has issued a booklet describing its electric starters for automobiles. These starters are designed to start any engine used in pleasure automobiles on the market today. The starter, which is of simple four-unit construction, is operated by a six-volt battery, which is charged from a lighting dynamo.

The Terry Steam Turbine Company, Hartford, Conn., announces that it has concluded arrangements with Fraser & Chalmers, Limited, 3 London Wall Buildings, London, England, whereby this firm will handle Terry steam turbines in England and all British colonies, excepting Canada. This arrangement does not include marine forced-draft sets, which as before are being handled by Yarrow & Company, Glasgow, Scotland.

U. S. Electrical Manufacturing Company, Los Angeles, Cal., has issued bulletin No. "A," describing its type "FR," constant-speed, riveted-frame, polyphase induction motors. These motors supersede type "C," and embody all the desirable features of the older type. The motors are made for two and three-phase operation, in capacities up to 15 horsepower. A supplement to this bulletin gives diagrams showing the general construction and ventilation of the motors.

The Robbins & Myers Company, Springfield, O., manufacturer of the famous "Standard" line of small motors and fans for ceiling, desk, bracket, etc., has accepted an invitation to membership in the Rice Leaders of the World Association. The membership of this association is composed of leading manufacturers, each representing a different line of industry. The object of the association is co-operatively to exercise the united prestige of members towards the development of their interests individually.

Mohawk Electric Manufacturing Company, Newark, N. J., has issued a pamphlet describing the Mohawk electrolytic rectifier for use in charging storage batteries from alternating-current circuits. This equipment consists of an aluminum-cell rectifier together with switchboard, transformer and all necessary instruments, switches, etc. The pamphlet describes the equipment in detail and shows how easily its operation can be carried on. Storage batteries suitable for fire alarm, telephone, telegraph and similar service are also described.

The Dana Manufacturing Company, Cincinnati, O., has issued a large well illustrated folder describing the electric general power machine and ice-cream freezer manufactured by the company. This compact equipment is composed of a motor arranged for driving an ice-cream freezer, an ice crusher and an auxiliary shaft on which may be mounted an emery wheel, buffer or other device, or which may be connected to a washing machine, ironer or other household appliance. The outfit, therefore, is suitable for general utility in households, boarding houses, hotels, clubs, ice-cream parlors, etc.

Safety Insulated Wire & Cable Company, 114 Liberty Street, New York, N. Y., has issued a little folder entitled, "How One Town Solved Its Lighting Problem." This folder explains how Forest Park, Ill., was able to obtain an underground lighting system with limited means. "Safety" steel-taped cable was laid in shallow trenches dug along the curb, the dirt thrown in and the bricks replaced. In this way an underground system to replace unsightly poles and wires was completed in the shortest time, and at an extremely low cost. The cable is waterproof, heat-proof and practically accident-proof.

Elmer P. Morris Iron Works, Incorporated, 136 Liberty Street, New York, will hereafter act as selling agent for the lamp-post and electrical accessory department of the Central Foundry Company, of New York. The latter company has taken over all designs, patterns, patents and good will of the Elmer P. Morris Iron Works. For the present the manufacturing of this line will be carried on at the Central Foundry Company's plant at Baltimore, Md., and as soon as duplicate patterns and equipment can be secured additional manufacturing will be done at other plants of the Central Foundry Company, namely, at Newark, N. J.; Medinah, N. Y.; Vincennes, Ind.; Holt, Bessemer and Anniston, Ala.

The Barber-Dwinnell Electric & Manufacturing Company, Kansas City, Kans., has published a very interesting and practicable net-price sheet on electrical material. This book has been prepared for the busy electrical contractor and central-station manager who often have to figure prices on apparatus and have not the time necessary to figure a string of fractional discounts and then get the freight rate from some distant city in order to arrive at cost. All discounts have been figured, excepting those for cash, and the prices given are all net prices to the trade. In every case possible prices are also listed F. O. B., cars Kansas City. The company is doing a fine business and announces that the prospects in general are brighter this spring than they have been for many years. The installation of a three-phase plant at Burwell, Neb., and a storage-battery lighting plant at Milligan, Neb., have just been completed.

The General Electric Company, Schenectady, N. Y., has issued bulletin No. A4200, which illustrates and describes strain insulators and strain clamps, suitable for insulating and supporting power-house wiring and overhead distributing cables and wires. Catalog numbers and prices of the various articles are given. Bulletin No. 44590 describes the type ML governor, the function of which is to automatically control the operation of either stationary or railway motor-driven air compressors in order to maintain air pressure in a storage reservoir between predetermined limits. Bulletin No. 47400, illustrating and describing the Type F, Form K12 oil switches has recently been issued. This supersedes a previous bulletin on this subject, and contains up-to-date information on this important piece of apparatus. The company has also issued bulletin No. 45601, entitled "Aluminum Lightning Arresters for Alternating-Current Circuits," which supersedes bulletin No. A4042 on the same subject. The bulletin consists of thirty-two pages, filled with detailed information relative to these arresters and choke coils for use with them, with notes on the charging operation, installation and ground connections. There are also diagrams and tables of dimensions of both arrester and choke coils. Another recent bulletin is one, No. 45,600, which describes vacuum-tube lightning arresters for use in connection with railway signal circuits. It supersedes the company's previous bulletin on the same subject.

Record of Electrical Patents.

Issued by the United States Patent Office, March 17, 1914.

1,090,154. Electrolier. J. H. Jones, Leavenworth, Kans. An extensible fixture having a spool with special contacts and brush to permit lowering of the body of the fixture.

1,090,159. Brush-Holder. J. C. Lincoln, Cleveland, O. A special adjustable spring construction.

1,090,170. Safety Appliance for Elevator Cars. C. Schenck, assignor to Elevator Supply & Repair Co., Chicago, Ill. Includes electromagnetically controlled locks for the shaft doors interconnected with the circuit of the elevator motor.

1,090,190. Electrically Connecting Device. R. James Bell, Harvey, Ill. A J-shaped bolt grasps the base of a rail and carries a sleeved head to receive the end of an electric wire.

1,090,201. Charging-Switch for Storage Batteries. C. W. Coleman, deceased, by K. Coleman, administratrix, Westfield, N. J., assignor to Hall Switch & Signal Co., New York, N. Y. A rotatable switch to connect two batteries alternately to the charging and discharging circuits.

1,090,213. High-Speed Railway. T. L. Johnson, Cleveland, O.; M. J. Johnson, administratrix of said T. L. Johnson, deceased. An electric traction system in which the truck carries an electromagnet to both lift and propel itself along the track.

1,090,215. Mechanism for Electrically Controlling and Operating Fare-Registers and Other Devices. E. J. Kennedy, New York, N. Y. An automatic repeating switch controlled by a push-button.

1,090,217. Telegraphy. I. Kitsee, assignor to American Telephone & Telegraph Co., New York, N. Y. Provides means for transmitting Morse messages by a series of impulses of alternating polarity.

1,090,234. Insulating and Supporting Mechanism. J. W. Rogers, Woodbury, N. J., assignor of one-half to N. Shute. For mounting a third rail in an insulating trough and a guard above the rail.

1,090,237. Automatic Valve-Alarm System. F. V. Sackett, assignor to General Fire Extinguisher Co., Providence, R. I. A spring motor closes the alarm circuit when the pressure is varied.

1,090,238. Electric Curler and the Like. E. Schwartz, assignor to Wm. E. Slaughter Co., Chicago, Ill. Relates to the terminal arrangement.

1,090,254. Lamp-Shade Holder. F. W. Wakefield, assignor to F. W. Wakefield Brass Co., Vermilion, O. Has rotatable disks to engage a flanged lamp socket.

1,090,301. Control of Signal Lamps. L. A. Hawkins, assignor to Union Switch & Signal Co. Special control for railway lamps supplied through transformers.

1,090,302. Vehicle Signal. J. B. Hawks and H. R. Kennedy, Los Angeles, Cal. An electrically lighted rotatable direction indicator.

1,090,309. Electric Railway Signal. J. B. Howell, Leavenworth, Kans. A two-armed switch lever is mounted above the trolley wire so as to be actuated by the trolley wheel.

1,090,328. Single-Phase Motor. C. B. Mills, assignor to Westinghouse Electric & Mfg. Co. Comprises a commutator, a ring with a garter spring located in its groove and a relatively low-resistance short-circuiting shunt comprising a braided tubular member within the garter spring.

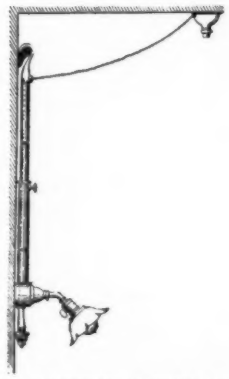
1,090,339. Electrically Heated Stove. T. S. Perkins and E. E. Rose, assignors to Westinghouse Electric & Mfg. Co. A disk stove with gear-operated switch controlled from the side.

1,090,354. Socket for Incandescent Electric Lamps. W. C. Tregoning, assignor to Tregoning Electric Mfg. Co., Cleveland, O. Covers details of the key switch.

1,090,357. Electric Signal System for Railways. H. J. Warthen, Washington, D. C. Block system with control of locomotive cab signals through ramp rails along the track sections.

1,090,358. System for Controlling the Operation of Railroad Trains. H. J. Warthen. Electrical control of the air brakes through track circuits with ramps.

1,090,359. Electric Train-Control System for Railroads. H. J. Warthen. Relates to the track circuits and ramps.



1,090,374.—Portable Bracket Fixture.

1,090,360. Electric Signal for Railroads. H. J. Warthen. A special contact shoe on the train engages a track ramp and actuates a solenoid.

1,090,361. Apparatus for Controlling the Speed of Railroad Trains. H. J. Warthen. The spindle of a flyball governor belted to the axle electrically controls an air-brake valve.

1,090,362. Electric Signal for Railways. H. J. Warthen. An automatic block signaling system.

1,090,363. Trolley for Electric Signals for Railways. H. J. Warthen. For engaging an inverted third rail.

1,090,365. Printing Telegraph. J. E. Wright, Pittsburgh, Pa. Includes electrically controlled stops for limiting the rotation of a spindle.

1,090,366. Keyboard for Printing-Telegraph Systems. J. E. Wright, assignor to Wright Telegraphic Typewriter Co., New York, N. Y. Includes key-controlled circuit selectors and means controlled by the transmitting sunflower for connecting the selected circuits with their corresponding sunflower segments.

1,090,367. Translator for Printing-Telegraph Systems. J. E. Wright, assignor to Wright Telegraphic Typewriter Co. Includes special electromagnetic control.

1,090,368. Transmitter for Printing-Telegraph Systems. J. E. Wright, assignor to Wright Telegraphic Typewriter Co. Includes two normally locked sunflower instruments having corresponding contact segments and located at opposite ends of the line.

1,090,369. Insulating Sleeve or Tube Machine. F. Wunderlich, assignor to Westinghouse Electric & Mfg. Co. Comprises a rotary shaft, resilient means for wrapping a flexible sleeve about the shaft, means for preventing turning of the sleeve with the shaft and a chute for feeding insulating strips into the sleeve.

1,090,372. Dry Battery. J. A. E. Achenbach, Hamburg, Germany. Comprises a central positive electrode, surrounded by a negative electrode consisting of several layers of corrugated finely perforated zinc, and a semisolid electrolyte.

1,090,374. Portable Electrolier. G. H. Barnhart, Ouray, Colo. A bracket arranged for vertical telescopic adjustment and adapted to be suspended from a picture molding. (See cut.)

1,090,378. Railway-Signal-Operating Mechanism. J. Blackburn, Kirkwood, Mo. An electric motor-operated semaphore.

1,090,388. Automatic Labeling-Machine. T. M. Foote, assignor to National Binding Machine Co., New York, N. Y. Includes an electrically actuated knife.

1,090,391. Apparatus for Manufacturing Nitrogen Compounds. T. Fujiyama, Tokyo, Japan. Has an electric heater in the chamber.

1,090,394. Coil-Insulating Machine. E. Haefely, assignor to Westinghouse Electric & Mfg. Co. Comprises a rotary hollow member having a pair of internal pivoted arms and pressure members at the extremities thereof.

1,090,412. Circuits for Automatic Fire-Indicators. O. Rennert, Munich, Germany. Comprises a pair of normally closed circuits and a number of thermal circuit-closers interposed in parallel between one side of each of the circuits.

1,090,413. Apparatus for Producing Photographic Time Records of Meter Readings. S. G. Rhodes, assignor to T. E. Murray, New York, N. Y. Includes an electric meter and clock, a continuous sensitized record strip, means for projecting an image of the dials upon the strip, a motor for actuating the strip and a clock-controlled electromagnet governing the motor and in circuit with the meter.

1,090,419. Calibrating Device. S. D. Sprong, Brooklyn, N. Y. For checking a D'Arsonval instrument.

1,090,427 and 1,090,428. Electric Zinc-Furnace with Integral Condenser. J. Thomson, New York, N. Y. Has a carbon-bed resistor.

1,090,429. Universal Electric Furnace, Combined with Means for Condensing Zinc. J. Thomson. Has a resistor resting on an open table.

1,090,435. Harmonic Signaling System. H. G. Webster, Chicago, Ill. Telephone ringing system with sources of alternating current producing frequencies of 33.3, 50 and 66.7 cycles.

1,090,436. Call Bell. H. G. Webster. A telephone bell with a tuned electromagnetic reed striker.

1,090,445. Cartridge Fuse. L. D. Blackman, Battle Creek, Mich. Has special terminal construction.

1,090,455. Railway Signaling Apparatus. W. J. Cook, assignor to Cook Railway Signal Co., Denver, Colo. A ramp adjacent the track actuates an electrically operated alarm on the train.

1,090,456. Process of Forming Joints. W. A. Darrah, Brooklyn, N. Y. The end of an insulating tube is rendered conducting and a metal is then electro-deposited thereon.

1,090,465. Adjustable Lamp-Shade. F. Evans, assignor to Patented Devices Co., New York, N. Y. A circular screen held by fingers projecting perpendicularly thereto engages the lamp bulb.

1,090,481. Fan. F. Lambert, Brooklyn, N. Y. An oscillating fan motor.

1,090,489. Meter-Testing Cutout. T. E. Murray, New York, N. Y. An electric cutout having contact clips, fuses and a testing plug.

1,090,497. Sprinkler Supervisory System. C. F. Patterson, New York, N. Y. Includes a number of contact devices actuating an electric signal system for indicating pressure and movement of water in the riser.

1,090,516. Apparatus for Magnetizing Desulfurized Ores. G. S. Brooks, assignor to Mineral Point Zinc Co., Depue, Ill. Has means for increasing the magnetic gap between the constituents of the dead roasted ore.

1,090,527. Cap and Shell Fastening for Lamp-Socket Casings. E. H. Freeman, Trenton, N. J. Has a locking tongue with external operating means.

1,090,528. Electrical Border-Light Receptacle. E. H. Freeman, assignor to E. H. Freeman Electric Co., Trenton, N. J. Has an L-shaped body with a socket and a wiring base projecting at right angles to the socket. (See cut.)

1,090,557. Transmitter. R. S. M. Mitchell, assignor to Talking Moving Picture Co., Syracuse, N. Y. A three-way telephone transmitter.

1,090,568. Means for Collectively Actuating and Controlling Alternating-Current Motors. J. L. Routin, Paris, France. Means for furnishing stators of induction motors with single-phase and polyphase current and of transmitting current generated in the rotors for the purpose of producing synchronous rotation of other motors.

1,090,579. Electric Hair-Drier. J. T. Stapleton, Jersey City, N. J., assignor of one-half to V. H. Skinner. Includes use of electric heating coils.

1,090,580. Apparatus for Starting Multiple-Cylinder Internal-Combustion Motors. H. Stöcker, assignor to Weckerlein & Stöcker, Nuremberg, Germany. Includes use of main and auxiliary magnetos.

1,090,600. Starting Device for Internal-Combustion Engines. D. E. Crouse, assignor to Auto Air Appliance Co., Baltimore, Md. Includes electromagnetic control gear.

1,090,618. Process and Machine for Making Switch Parts. W. F. Hosford, assignor to Western Electric Co. An electric welding process involving the use of a transformer.

1,090,619. Process and Machine for Forming and Affixing Switch-Contacts. W. F. Hosford, assignor to Western Electric Co. A modification of the foregoing.

1,090,622. Picture-Projecting Device. C. F. Jenkins, Washington, D. C. Has a special arc and controlling rheostat therefor.

1,090,624. Casing for Electric Cells. I. Kaempfer, New York, N. Y. A sealed paper carton with a contact at each end.

1,090,627. Signaling Device for Party-Line Telephones. T. Kernan, East St. Cloud, Minn. Includes a motor for operating the signaling device.

1,090,629. Electric Socket. G. C. Knauff, Chicago, Ill. A keyless socket associated with a plug connector.

1,090,630. Socket for Electric Lamps. G. C. Knauff. Covers details of the foregoing.

1,090,657. Trolley. H. Shaffert, East Pittsburgh, Pa. A trolley harp of box-like construction.

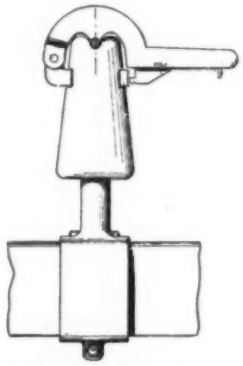
1,090,528.—Border-Light Receptacle.

1,090,672. Electric Curling-Iron Heater. C. H. Austin, Palmyra, N. Y. A heater with a socket-connecting plug at one end is arranged for receiving the curling iron.

1,090,682. Electric Shoe. K. H. Brown, Chicago, Ill. Has an electric cell in the heel and electrodes at the ankle.

1,090,686. Insulator Clamp. W. A. Cook, Shinnston, W. Va. Has special means for clamping the wire. (See cut.)

1,090,726. Carbon-Holder for Electric-Arc Lamps. B. B. Lacy, Houston, Tex., assignor to H. E. Elrod. Special clutch construction.



1,090,686.—Insulator Clamp.

1,090,763. Electric-Battery Cell. H. A. Thomas, Springfield, Ill. The anode contains zinc, bismuth, mercury and platinum.

1,090,794. Automatic Circuit-Closing Device for Elevators. C. W. Sauer, Jr., Elizabeth, N. J. Associated with elevator doors.

1,090,795. Lighting Fixture. F. P. Schoenhardt, assignor to Edward Miller & Co., Meriden, Conn. An indirect fixture having translucent top and side openings.

1,090,805. Junction Box. J. F. Wagner, assignor to Arnold-Wagner Electric Co., South Bend, Ind. An integral box with special lugs at the side and rear.

1,090,806. Automatic Air-Brake Control for Railways. H. J. Warthen, Washington, D. C. Includes electro-magnetic means for controlling air-brake valves.

1,090,815. Spark Plug. F. E. Harter, Olympia, Wash. Covers details.

1,090,816. Signaling Device. C. Henschel, assignor to Chas. Cory & Son, New York, N. Y. Has a toothed disk and a number of circuit-control switches.

1,090,821. Telephone System. F. R. Farker, Chicago, Ill. Includes a special signaling system.

1,090,825. Railway Signaling System. M. H. Collins, West Hoboken, N. J. An alternating-current block signal system.

Patents Expired.

The following United States electrical patents expired March 23, 1914.

579,161. Electric Arc Lamp. J. A. Mosher, Chicago, Ill.

579,169. Sand-Box for Electric Cars. M. M. Nash, Lowell, Mass.

579,169. Telegraph Call-Bell. J. N. Newsom, St. Louis, Mo.

579,170. Electrically Operated Signal or Semaphore. J. N. Newsom.

579,211. Electrical Amalgamator. W. Wright, New York, N. Y.

579,213. Device for House-Wiring. H. R. Young, Lakeport, N. H.

579,221. Signal-Recording Mechanism. A. E. Colgate, New York, N. Y.

579,227. Electric Incandescent Lamp. F. L. Fowler, Philadelphia, Pa.

579,239. Telephone Spring-Jack. W. O. Meissner, Chicago, Ill.

579,249. Electrical Gas-Cock. F. W. Ackerman, Corning, N. Y.

579,267. Carbon-Holder. C. E. Harthan, Lynn, Mass.

579,268. Arc-Light Cutout. C. E. Harthan.

579,273. Zinc for Electric Batteries. F. A. Lane, Torrington, Conn.

579,283. Alternating-Current Dynamo-Electric Machine. C. P. Steinmetz, Schenectady, N. Y.

579,300. Electric Railway. E. Lachmann, Hamburg, Germany.

579,299. Telephone-Exchange System. J. E. Kerlyn, Chicago, Ill.

579,324. Electric Furnace. W. S. Hadaway, Jr., New York, N. Y.

579,344. Electrical Measuring Instrument. E. J. Houston and A. E. Kennelly, Philadelphia, Pa.

579,361. Method of Manufacturing Electrodes for Secondary Batteries. L. Epstein, London, England.

579,366. Circuit-Breaker. F. C. Robertson, Toronto, Canada.

579,380. Trolley Support for Electric-Railway Cars. J. F. S. Branth, New York, N. Y.

579,393. Electric Sunshine-Annunciator. L. Hunt, St. Louis, Mo.

579,395. Electrical Transformer. F. H. Jeannin, Arcadia, Fla.

579,431. Automatic Electromagnetic Circuit-Breaker. W. E. Harrington, Philadelphia, Pa.

579,459. Electric Heater. G. H. Whittingham, Baltimore, Md.

579,473. Electric Time Check and Recorder. A. Davidson, New York, N. Y.

579,482. Telephonic Messenger Service. J. D. Hobbs, New York, N. Y.

579,511. Electrically Operated Sewing Machine. J. S. Biggar, Chicago, Ill.

579,525. System of Circuit and Apparatus for Electric Railways. G. Westinghouse, Jr., Pittsburgh, Pa.

579,526. Electropneumatic Locomotive. G. Westinghouse, Jr.

579,527. Electric-Railway System. G. Westinghouse, Jr.